School Shop

vol. XVIII no. 9
MAY 1959

A Year in a Maze
by John D. Rowlett
"School-Involving Project"
by William B. LaPorte
Hi-Fi Cabinet
by Rex Miller

Cover Story: Two Northfield, Minnesota, students learning how it is possible to harness the sun's rays during a tour of the Minneapolis-Honeywell research and engineering exhibit at Minneapolis. At right is James Renier, a scientist from the firm. Next to him is Dr. Walter Orr Roberts of the University of Colorado. To gain insight into the problems of challenging your students—as these lads were challenged at the exhibition—page 7.

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School Shop TALK

COMMENTS ON ISSUES FACING INDUSTRIAL EDUCATION

Industrial Education Is Big Business!

For some time we at SCHOOL SHOP have been curious about the extent of the purchasing of equipment by our readers. Moreover, our advertisers have asked for information on this point. Naturally, we are not ones to take such requests lightly so we went to work on the job. The results were so enlightening that we think you will find them interesting and informative.

What we wanted to find out was the kind and amount of equipment purchased by shop teachers in a single year, what shop teachers were planning in the way of equipment purchases in the near future, and how the mechanics of purchasing this equipment are carried out.

To dig out this information, which had never been gathered before on a nation-wide basis, we used the time-honored technique of the questionnaire. It was a lengthy six-page affair sent to every twentieth name on our mailing list so that we got a good cross section or sampling. We thought its length might reduce the number of those who would take the trouble to respond, but happily about 36 per cent returned them—a notable figure for questionnaires of this type and length. Our thanks to our loyal readers who sent them back.

A few weeks that lengthened into months with the adding machine and the tabulation sheets were spent recording, tabulating, checking, and cross checking until finally we came up with some facts never before brought to light.

For instance, we discovered that the shop teachers who answered the questionnaire met an average of 135 different students each week. We know that there are over 30,000 industrial-education teachers in the country and the figure may be closer to 35,000. If our average holds true for all shop teachers, there are more than four million students taking industrial-education courses in schools today. This is an increase of over a million in the last decade.

We asked the question: "How much money is being allowed for purchase of equipment for 1958-59?" A total of 351 out of the 498 responses gave figures ranging from "nothing" to $50,000. The total figure for the 351 responses was $589,659, or an average of approximately $1680 per teacher. If the average of $1680 expenditure per teacher is multiplied by the 30-35,000 industrial-education teachers in the country, the total figure for this year's purchases comes to between $50,000,000 and $50,800,000.

The above figures do *not* include the amounts to be spent for completely equipping new school shops. More than 14 percent of the 147 responses not counted in the compilation above stated that new shops were being equipped this year—a husky total when projected for the country as a whole. New junior- and senior-high schools are going up in most sections of the country to bear this out.

We also asked in the questionnaire who makes the decision as to the brand and quality of equipment and materials to be ordered. Of the 450 answering the question, 77.8 percent stated that they made the decision. However, only 40.2 percent actually sent out the purchase orders. Supervisors, directors and department chairmen sent out 18 percent of the orders while the remaining 41.8 percent are sent out by school business managers, purchasing agents, superintendents, or principals.

Space is much too limited here to detail our findings about all specific items of equipment but some of the figures on certain items are so unusual that they bear mentioning. For instance, the lowly pencil is a popular item with drafting teachers. The even 100 drafting teachers answering the question stated that they were ordering 3193 dozen pencils! Drafting teachers also were planning to order seven drawing boards each, on an average. It will take several forests of trees to fill these orders on a nation-wide basis.

Metal lathes are also being ordered in quantities. One out of two machine-shop teachers will be adding a lathe this year, while nearly one out of three will be adding a milling machine.

Other kinds of equipment showed similar demand—adding up to the impressive totals listed above. There is no question in our mind but that industrial education is Big Business! With teachers by the thousands, pupils by the millions, and supplies and equipment by the trainloads, obviously the tax-paying public is supporting handsomely this phase of education and we, as teachers, have an obligation to make the public's investment pay off in the best educational program possible.—*L.W.P.*

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Industrial Education Department
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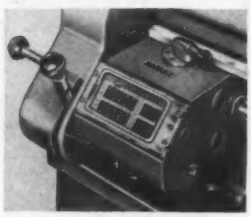

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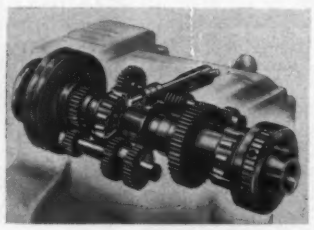

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IN THE *Morning Mail..*

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Dear Sir:

My son is in college and plans to become a teacher after graduation. I was looking over some back numbers of SCHOOL SHOP this morning, with the idea of clipping out a few of the Diamond Dust columns which I thought he might enjoy and would be of value to him. I had to give up trying to choose, for they were all of value but in different lines. I was wondering if those columns couldn't be gathered together and printed in pamphlet form.

I am sure many other teachers would buy these pamphlets, were they available. The best advice in the world is of no use if it isn't followed. Tom Diamond's is of the best, and his style of giving it out makes it sound like something you were already following or planned to take up next day.

Larmon L. Smith,
Pontiac, Mich.

(Editor's Note: We think your suggestion is a good one. As a matter of fact, we have been thinking about doing that very thing. We wonder if other readers would be interested.)

Dear Sir:

Sometimes I do ponder my mental status most seriously. It seems to me I can do the most stupid things in school, and the fewest clever things, of anybody—except maybe the boss. To be right honest, that fellow in the wood shop just plainly hurt my feelings.

It happened the other day. As so often happens, the new maps that came for my room just had to have nails in a different place on the black board trim to hang them on. I knew the janitor and the boss would be located in the boiler room having a quick "conference," so I figuerd I'd ask the woodshop teacher for a hammer and nails. I sent a note and asked him just that. I got a six-pound sledge and a railroad spike.

I went down to see him and he acted awful "up-stage." Said he, a woodshop teacher had to know where Patagonia and Ceylon were on those maps, so it was only right that geography teachers learn how to ask in an intelligent fashion for the tools they need to hang up the map. He said he wasn't a mind reader and could only tell fortunes to the extent of telling if school teachers were smart or dumb. If he said "dumb," he was right most of the time, he snarled. See what I mean when I say I got my feelings hurt?

What would you do about it? Last thing he said, as I slammed the shop door, was that he'd give with some education around here if he had to give the railroad spike treatment to the whole d——— school board. Wouldn't you consider that pretty strong talk?

Timothy Clover

(Editor's Note: We have a sneaking suspicion that Timothy Clover, above, is actually an industrial-arts teacher in one of the eastern states.

Dear Sir:

I am enclosing coupons for materials listed in the October issue. This magazine SCHOOL SHOP is certainly a valuable help for a "moving" teacher who wants to keep up with the latest.

R. E. Denger,
Dwight L. Barnes Junior-High School,
Kettering, Ohio

HAVE AN "EDUCATIONALLY CORRECT"

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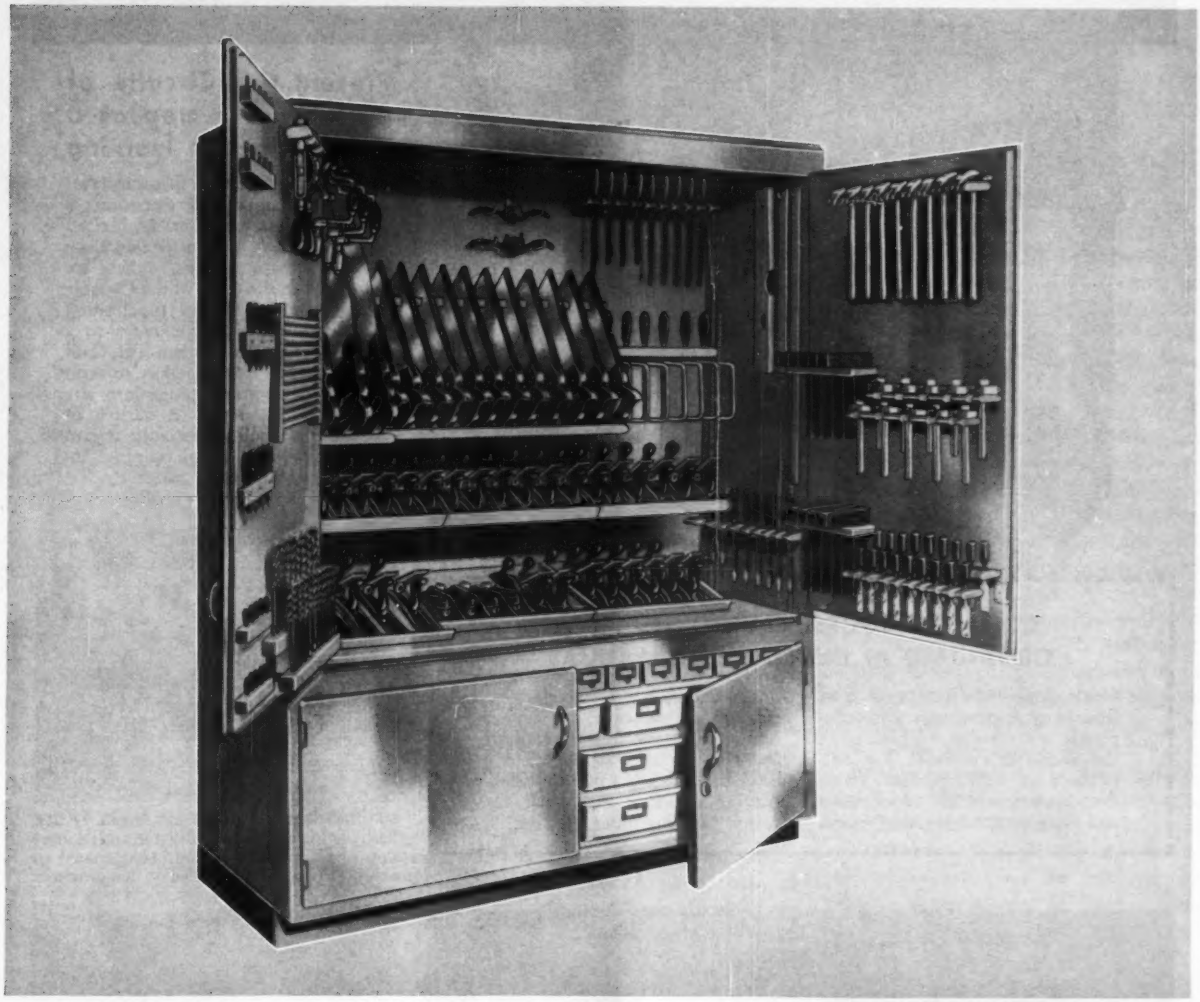

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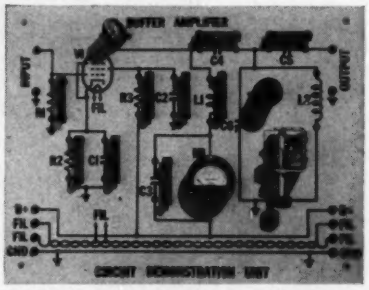

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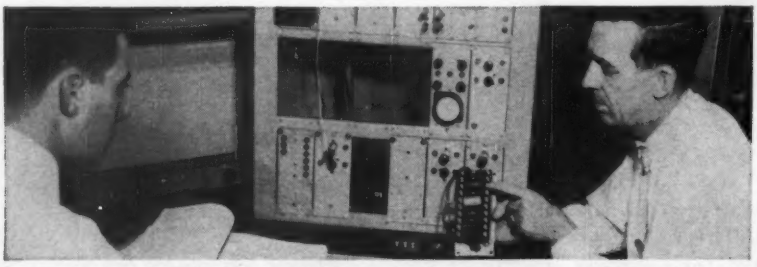

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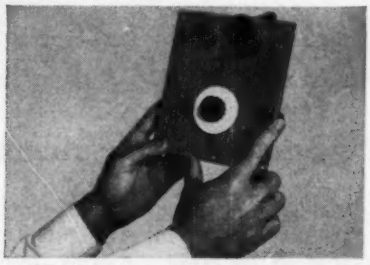

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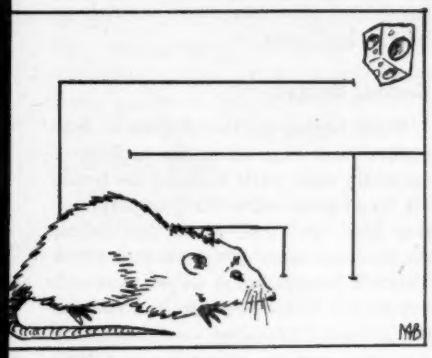
A Year in a Maze

or

Why Should Rats Be Given Greater Challenges than Industrial-Arts Students?

By John D. Rowlett

Assistant Professor, Eastern Kentucky State College, Richmond (on leave)



IF somebody were to prod certain industrial-arts teachers from a deep and peaceful slumber and ask them to recite the objectives of their work, they could chorus them in unison, and very easily. Even in a semistupor we could all make the same response, with equal facility and with reasonable accuracy, because of our deep commitment to these objectives. They are thoroughly ingrained in our thought patterns.

Similarly, we are committed to the notion that the industrial-arts project has a valid place and function in our teaching programs. However, the way we choose to use the project as a vehicle for learning indicates, at least implicity, the acceptance of one theory of learning and seeming rejection of alternative theories.

To suggest that industrial-arts teachers disagree on this critical issue is almost an understatement. The differences of opinion reflect, essentially, varying concepts of the way people learn and, of equal importance, teachers' beliefs concerning students' capacity to direct their own behavior, to solve problems that have meaning as well as personal importance.

Following Directions

If we are totally committed to the belief that students learn to do by doing and that they learn to do what they do, then we will begin to believe, too, that projects have functions that are very different from those perceived by teachers who insist that their students develop problem-solving by completing a rigidly prescribed series of preplanned (if not precut) projects that in reality are no more than a distillation of the teacher's thinking. The only genuine problem facing a student in the latter type of learning situation is simply "how to follow the teacher's directions."

At a recent meeting of industrial-arts teachers, a panel discussed the topic: "What Constitutes a Modern Industrial-Arts Program?" One of the panelists related his plan for providing for individual differences in the shop: A dozen or so teacher-designed projects—well analyzed and graded as to difficulty—are the core. All of his students start with the first project and move through the series at a rate commensurate with their abilities and interests. The assumption is, apparently, that since each student progressed through the series at his personal rate of speed—according to his personal abilities and interests—individual differences, consequently, would be allowed for. In other words, the slow student could move at his own pace without being pressured, and the gifted student would not be held back by those less fortunately endowed. Such a plan is not unique in our industrial-arts laboratories. Similar plans are advocated, defended, and practiced by teachers who honestly feel theirs is the way it should be done.

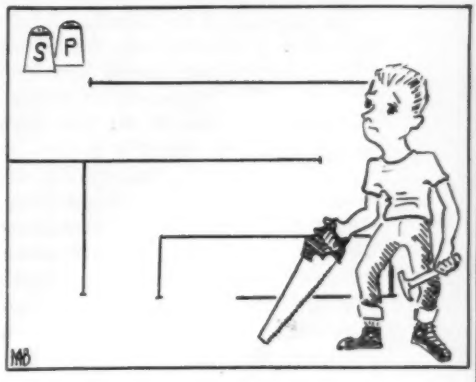
Rats Have It Better

It has occurred to me, though, that rats in a psychology laboratory are provided with more meaningful and challenging learning situations than the one just described. One of the simplest experiments for studying the behavior of rats involves depriving the animal of food for a specified length of time and then observing his speed as he scampers down an enclosed path toward the food that awaits him at the opposite end of the runway. An important assumption in this simple experiment is that the hungrier the rat is (within limits of endurance), the faster he will travel toward his goal. How different is this, really, from the assumption that the more intelligent the student, the faster he will progress along the "narrow runway" of a dozen or so required projects?

The psychologist controls the experiment by constructing barriers and walls to assure the proper direction of the rat's progress. How different, too, is this, really, from the learning situation where the student is compelled to move through a restricted series of required projects, "Number One," "Number Two," "Three . . ." "Twelve"? There is probably one real difference: Does the final project hold the same fascination for a student that a piece of food does for a hungry rat?

Psychologists, however, do not restrict their search for learning principles to the simple type of experiment just de-

(*Continued on page* 19)

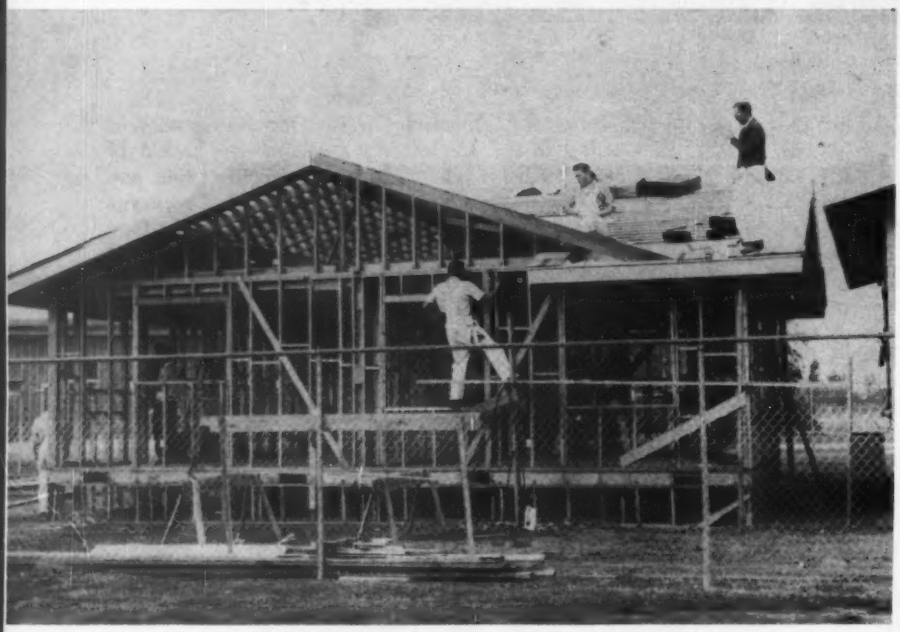


Eighteen different curriculum areas take part in this

"School-Involving Project"

By William B. LaPorte

Coordinator of Industrial Education, Whittier Union High School District, California



"Vocational Carpentry.—This class has the main job: Building the house . . ."

THE Whittier Union High School District carries on what it considers a "school-involving project." The basis of the project is building a house, a "real-live" house. It is basically a problem of the vocational-carpentry class but everybody, or nearly everybody it seems, gets in on the project. We will describe to you—area by area—how this is done, but first a little history.

This house-building project, involving a big, big part of the district's school population, is not brand new. We've been doing it for six years and we have built 11 houses. The program is carried on, presently, in three of the five high schools in the district.

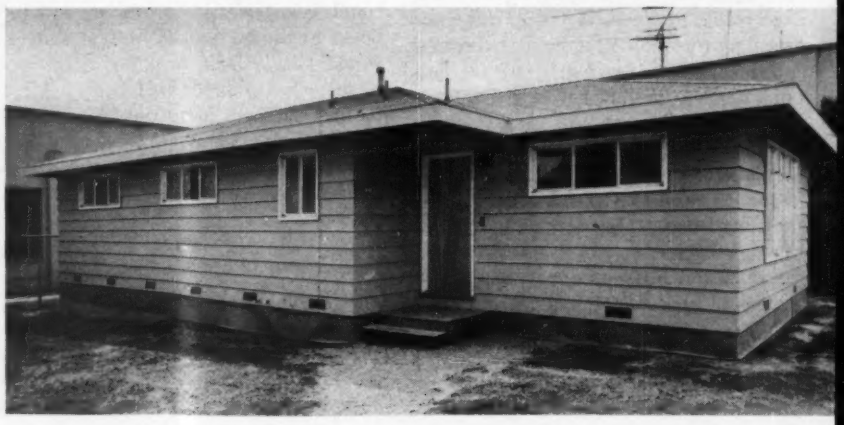
The house-building program has received community and industrial support. It has been recognized throughout the state, country, and, for that matter, will in the future be known throughout a good share of the world. A picture story in a national magazine brought our project to the attention of a New York City newspaper. The newspaper's report of the project brought it to the attention of the United States Information Agency. The USIA, in turn, has arranged with the school district to make a movie about the project. The script will be translated into several languages and it will be available for distribution in many parts of the world. And so the project's fame has spread here, there, and everywhere. Why? Here's why!

Getting Started

Work begins on the project in September each year when the vocational-carpentry class starts building the house. (A lot of preconstruction planning, getting bids, etc., took place long before the first nail was hammered into wood. This will be apparent as we progress with our story.) During the previous summer the industrial-education coordinator had contacted various industries and business firms that wanted to participate in the program either through donations or by making bids on certain items. The program leans on these industries for their contributions because without this participation the program would fail. Following the industry contacts, the carpentry class starts its work. The house is scheduled to be completed by, and ready for sale, the following June.

During the last two weeks of school, the house is open to the public, participating industries, and educators for their

A typical project house built by Whittier High School students during the school year 1957-58. This project has drawn national recognition. The USIA is preparing to tell the story to the world.



inspection. One of the local furniture firms furnishes the house with furniture selected by homemaking students. (Business people find this "open house" is a good chance for them to advertise their wares.) During the "open house," there is always a teacher "in charge," with a homemaking student to serve as hostess and a vocational-carpentry student on hand to answer questions concerning construction of the dwelling.

This opportunity to display the work of the students has proven to be valuable education for two major reasons: (1) The students have an opportunity to "meet the public." Approximately 10,000 people visited three of our houses during the spring of 1958. (2) Students find themselves in a situation where they have an opportunity to explain in detail what they have done as it applies to both the construction of the house and its furnishings. This compels a reasonably high quality of articulation, graciousness, confidence, poise, and presence.

How It Is Done

Throughout the development of the projects in the three schools, different curriculum areas are involved and so are the staff people. Following are brief descriptions of the function of the various areas and offices involved in our program:

Coordinator of Industrial Education.—The district coordinator of industrial education has the responsibility of coordinating the entire program for all three participating schools. In other words, three schools are involved in making three houses and he has to coordinate the activities within each school as well as oversee all three construction jobs as one big project.

He secures the bids from all subcontractors, informs instructors where to secure their building materials and supplies, and helps instructors get these materials and supplies as they are needed. He is in constant communication with all industrial-education department heads relative to the conduct of the "whole show."

His coordination job also requires that he check with other department heads involved in the program. He also confers regularly with each of the three participating schools' principals on the program's progress. Furthermore, he must keep the district-office personnel informed about the program's progress.

A major responsibility of the coordinator is to make all of the contacts with outside business firms concerned with the program. In addition he helps instructors place students and serves as an advisor on the Local Joint Apprenticeship Council for the carpentry trades. He calls and holds meetings of the District Advisory Committee, made up of labor and management in the carpentry trade.

Organization a "Must"

Principal.—The principal, in each case, approves purchases, assignment of teachers for supervision during all hours of the "open house," and the coordination of the program in his school. The industrial-education coordinator is available to each principal to help with any problem whenever he is needed.

District Business Office.—The district business office works with the industrial-education coordinator in publishing bids, advertising bids, and advertising the sale of the house when it is completed. This office also pays all of the bills.

Heads of Industrial-Education Department.—The industrial-education department heads bring to the coordinator's attention any problems the carpentry instructor might have. They also report to the coordinator on the status of their school's project. They assist their carpentry instructors with material and supply procurement, maintain the construction schedule so that the house will be finished in June, draw up plans for the following year's project, and coordinate activities of other participating departments.

Vocational-Carpentry.—This class has the main job: building the house. The instructor, in each instance, is responsible for contacting lumber dealers for delivery of lumber, the plumber when needed, floor finishers, the furniture store, and the electrical supply house, etc., when these different services or supplies are needed.

The instructor also has to maintain accurate billing and cost-account records of all of the purchases made. He submits to the coordinator a complete lumber list for the following year's house, well in time for it to be put out for bid. And the instructor does his part, too, in finding work for his students at the end of the school year.

Architectural Drawing.—The architectural-drawing class draws the plans for each of the houses. This year they're working on next year's house. The class and its instructor work closely with the carpentry instructor, the advisory committee, and other interested persons from industry, in formulating plans. Complete working drawings of the house are made by the students. The students visit the building site to gain first-hand experience of problems encountered in building a house and how they are solved.

Three interior scenes of a Whittier School District project house: the kitchen, living room, and bedroom. For the "open house" local merchants lend furnishings, taking advantage of an opportunity to advertise and to support the project.

It's a Big "Cast"

Mechanical Drawing.—This class makes working drawings of the plumbing, sheetmetal layout, and electrical work. The class visits the house while it is being built to observe problems typical of this kind of work and to watch the building go up. The class and its instructor work with industry on such problems as heat loss in forced-air heating systems, and the type of electrical wiring and materials that would be best suited for the house being designed for

(*Continued on page* 23)

Woodworking shop's contribution to music

A Cabinet to House a Hi-Fi System

By Rex A. Miller

New York State College for Teachers at Buffalo

A completed hi-fi cabinet. Plastic covering adds to its appearance.

ALTHOUGH hi-fi systems are the province of electricity and radio teachers, it is the woodworking teacher who ultimately houses the unit.

The cabinet shown in the accompanying photographs and drawings is made of plywood and covered with a plastic material. The reasons for covering the cabinet are: (1) Plastic is a common finishing material. (2) Plastic covering is easy to keep clean. (3) Joint work does not have to be "cabinetmaker" quality to achieve a finished appearance. (4) Using plastic covering material permits use of fir plywood, the least expensive plywood available. The record-changer part is covered with cloth, the rest, plastic.

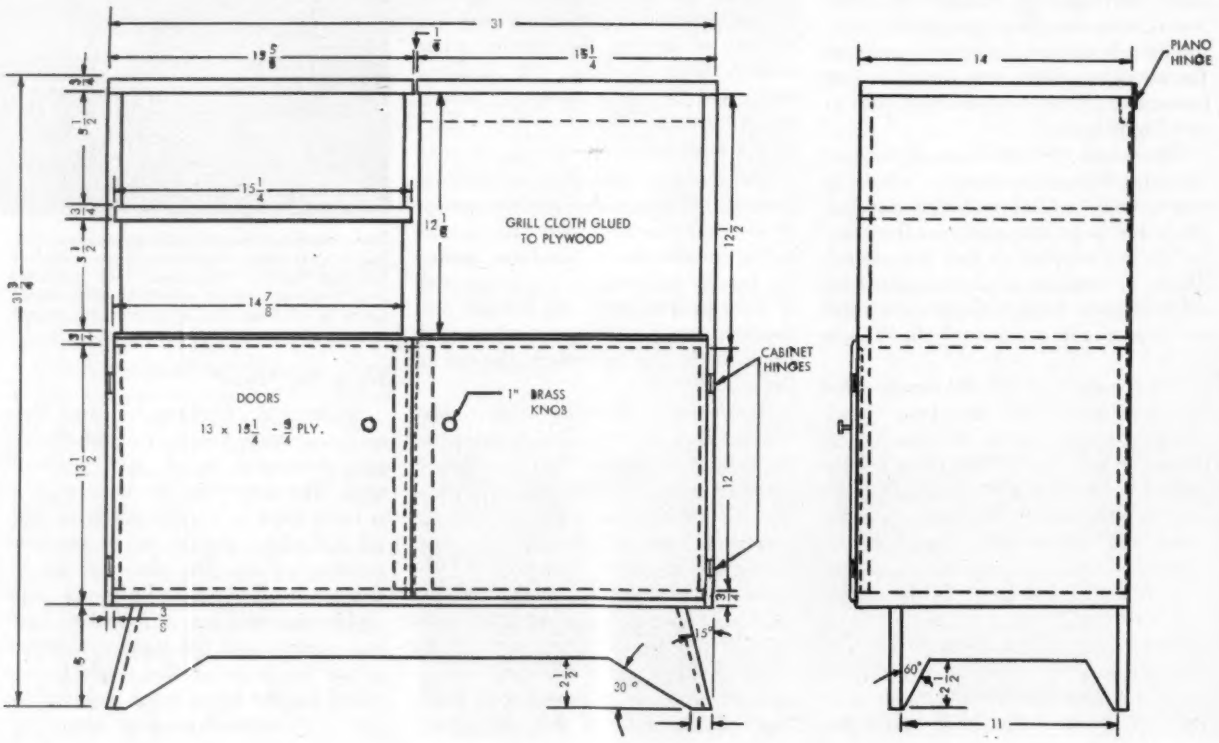
This cabinet has been designed to accommodate a Knight 18-W hi-fi amplifier and fm tuner plus a Garrard record changer mounted on a base. Storage space for 12" records has been allowed for. The speaker has been located in a corner enclosure to eliminate mechanical feedback.

It should be noted, too, that this cabinet can handle the 12-w Heathkit amplifier and the Heathkit f-m tuner.

The back of the cabinet is enclosed only on the record-changer side and the record-storage portion of the lower half.★

Bill of Materials

No. of Pcs.	Material
1	Fir plywood, ¾" x 4' x 8'
	Plastic covering, 2 yards
	Cloth, ½ yd.
	Enamel, flat, black
2	Hinges, wrought brass
2	Cabinet catches
2	Knobs, brass plated
1	Hinge, piano, 15" long
1	Hinge cover, supporting
2	Masonite pegboard, ⅛" x 13" x 15⅛"
1	Masonite pegboard, ⅛" x 12" x 14⅜"
	Glue, 1 pint
	Nails, 6d, finish, 1 lb.
	Shellac, ½ pt.
1	Aluminum foil, 16" x 30"
6	Woodscrews, steel, flathead, 1½", #9
68	Woodscrews, steel, roundhead, ¼", #4
	Padding compound, adhesive, 1 pt.

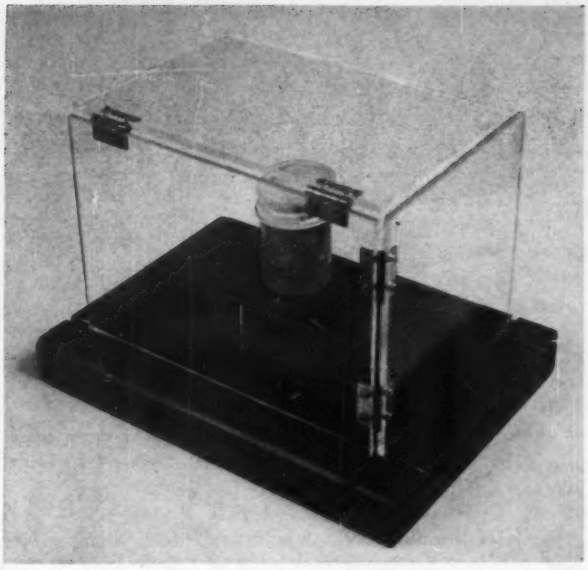


Shadow box for drafting students

Plastic and "Grease" Make the Difference

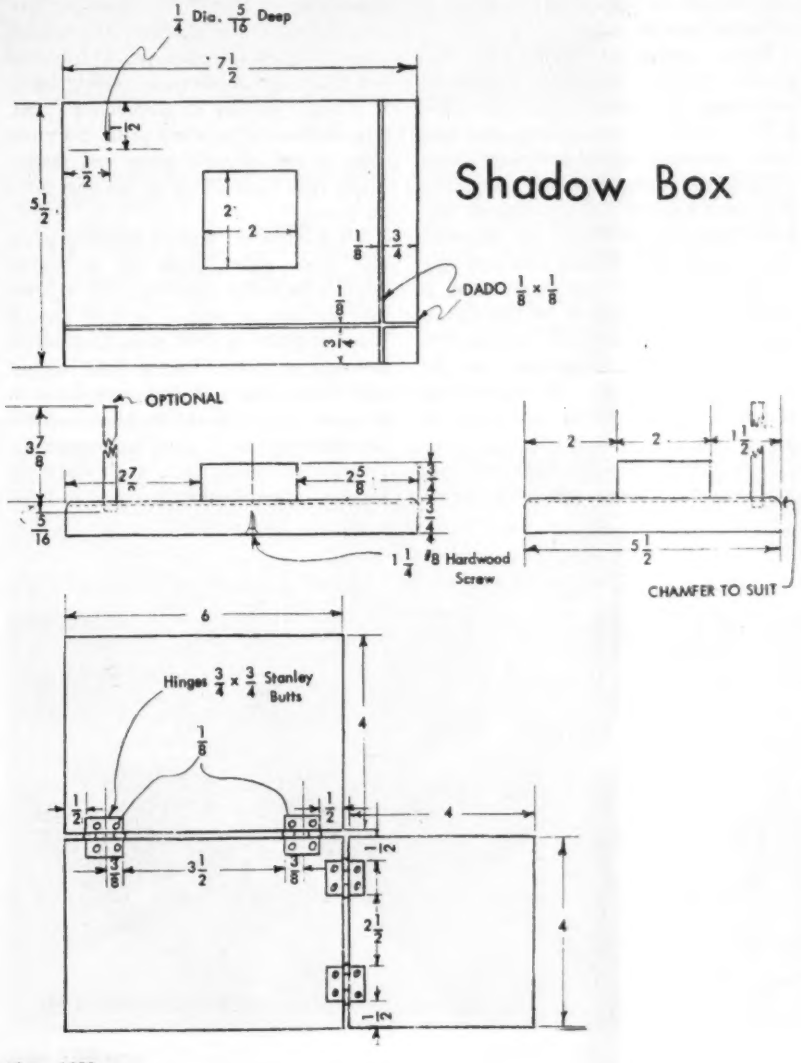
By Allen C. Willman

Washington Junior-High School, Duluth, Minnesota



The plastic shadow box showing an object that is ready for drawing.

ARE some of your mechanical-drawing students having difficulty visualizing objects? Then try this twist to an old stunt. Have them draw objects on this plastic shadow box with a grease pencil. It will save many hours in gaining understanding of thickness, height, and length of an object, and how to show them on a flat surface.



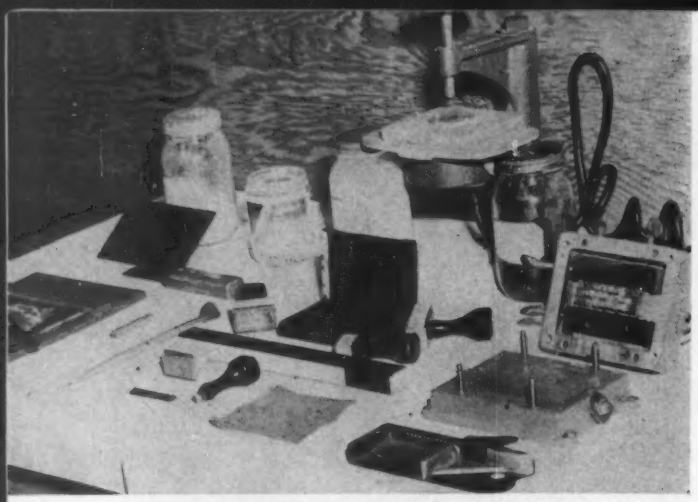
The object to be drawn is in the box—on the pedestal—and then with a grease pencil—China marking pencil, to some of you, perhaps—the student should draw exactly what he sees from directly above (top view), from directly in front (front view), and directly from the end (end view). He should then remove the plastic from its base and lay it flat on his desk or some other flat surface. Now—the clincher. He should study very carefully what he has done, especially the relationship of the views. It should become apparent to him why they are named top, front, and side and their relationship in a drawing.

It is advisable to keep the views as close to normal size as possible.

This box is very inexpensive to make and will pay for itself many times in teacher and student time saved. As a matter of fact, the boxes are small, and simple enough to make, that each of your students who have difficulty in visualization could have his own. Likewise, the grease pencils are inexpensive and their markings are easily wiped off the plastic. ★

Bill of Materials

No. of Pcs.	*Name of Part*	*Size*
4	Hinges	¾ x ¾
1	Base	7½ x 5½ S4S
1	Pedestal, wood	2 x 2
1	Top, clear plastic	⅛ x 6 x 4
1	Side, clear plastic	⅛ x 6 x 4
1	End, clear plastic	⅛ x 4 x 4
1	Screw, clear plastic	1¼, #8
1	Dowel (optional)	¼ x 4-3/16
16	Screws, #3	⅛, #3



All of the equipment needed to make rubber stamps is shown above.

A trade secret revealed

How to Make Rubber Stamps

By Peter E. Tobia
Eritrea Trade School, Ethiopia

ONE of the objectives of industrial arts is to develop in each pupil an interest in industry and to show how consumer products are made. This interest can best be obtained by not only studying an industry or a phase of one by using a textbook but also by actually making an object as it would be made in industry. The graphic-arts field lends itself very well to this objective.

Making rubber stamps by the vulcanizing method is a process that adds to the worth of the graphic-arts program. Rubber-stamp making requires only a few additional items of equipment other than those usually found in most graphic-arts shops. An initial investment of $50 to $75 would be sufficient for the additional materials and supplies needed for 25 pupils.

There is very little information available relative to rubber-stamp making because this process has been closely guarded as a trade secret for many years. Rubber stamps have many uses and serve many purposes, mainly as time-saving devices. Most business offices have a great variety of rubber stamps.

You can instill new interest in your graphic-arts program by introducing this process and at the same time you can achieve an important objective of industrial-arts education.

Major equipment needed for this process follows: molding compound, vulcanizer (Schrader & Co., Brooklyn, N.Y.), molding press, chase, and bed. Other materials needed are: steel plates, vulcanizing stamp rubber, mounting strip and handles, rubber cement, talc, knife, spatula, thickness jig, kerosene, clean rags, brush, mixing pan, and type.

There are four principal steps in making a rubber stamp by the vulcanization method. They are: setting type, making the mold, vulcanizing the die, and mounting the die. An outlined explanation of these four processes follows:

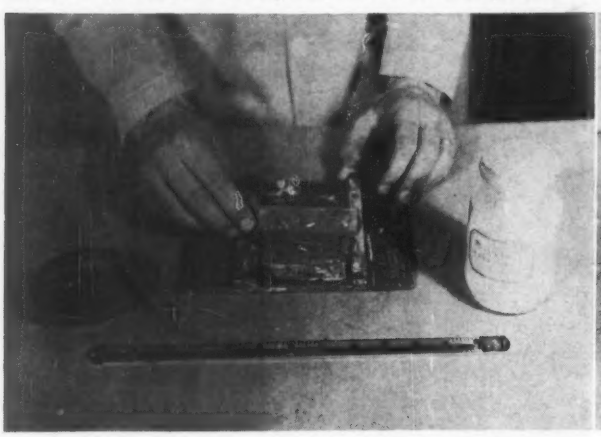
Setting the type—Set type according to copy. Take proof and check proof. (Note: Linotype or Ludlow may be used as well as foundry type.)

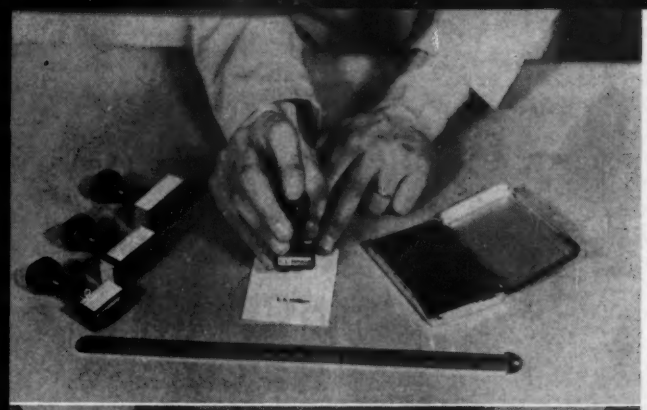
Making the mold—Mix molding compound to stiff consistency with water. Spread mixed compound on steel plate. Use jig to obtain uniform thickness, approximately 3/16". Let stand for five to eight minutes to set. Test by pressing a pencil point into mixture. If it comes out clean and mixture is getting hard, it is ready to take an impression. Lock type in chase of molding press. Set mold plate in bed of mold press and fasten. Clean type with kerosene, leaving some on type.

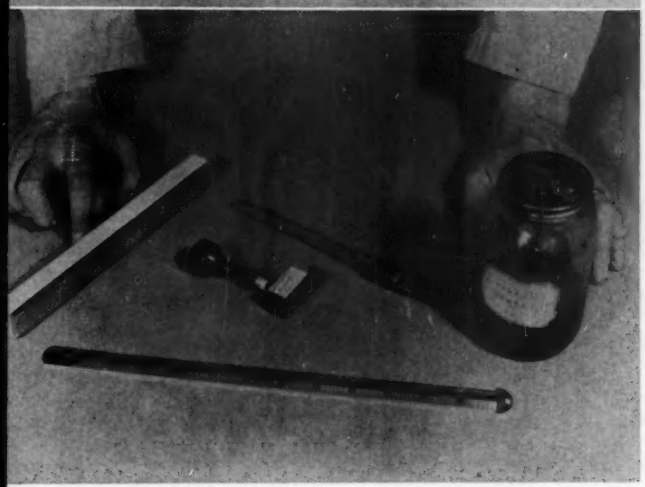
Place chase on pins of molding press and place entire press on drill-press table. (An arbor press or similar press may be used in lieu of a drill press.) Place a dowel in drill press and adjust pressure on chase. Take a light impression using handle of drill press for even pressure. Type should be immersed below shoulders for a good impression.

Remove mold plate and allow to harden, usually overnight for best re-

Below left: Spreading the molding compound on the steel plate in the thickness jig. Below right: Placing the mold in the molding-press bed.







At left: material for mounting the die (bottom photo). Completed stamps (top photo) and one of them being used.

sults. The mold should be allowed to become brick hard.

Vulcanizing the die—Sandpaper the mold to obtain a level surface because some of the compound will be raised due to displacement by the type when making the impression. Place plate on vulcanizer and allow to heat. Test by placing a drop of water on plate. Moisture should disappear with a popping sound. Vulcanizing temperature is 360° F.

Cut a piece of rubber slightly larger than mold impression. Dust uncovered side of rubber with talc and tap off excess. Dust the mold and blow out excess. Remove the protective tape from rubber, dust with talc, and place this side on mold. Place a flat piece of light-gage metal on top of the rubber and a wood block above it. Tighten down hand screw and note time.

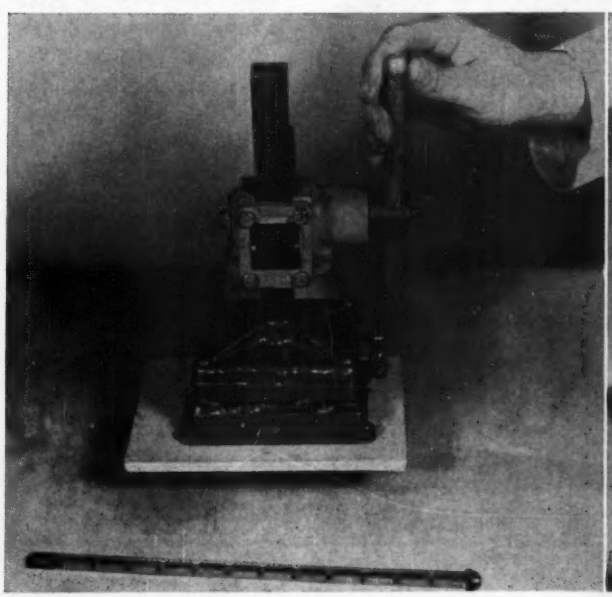
Allow to vulcanize about five to six minutes. Take up on hand screw during vulcanizing process. After vulcanizing process is completed, remove from vulcanizer and allow to cool. Do not try to remove the die until it cools because you will stretch and distort the die. When cool, remove the die and trim it carefully.

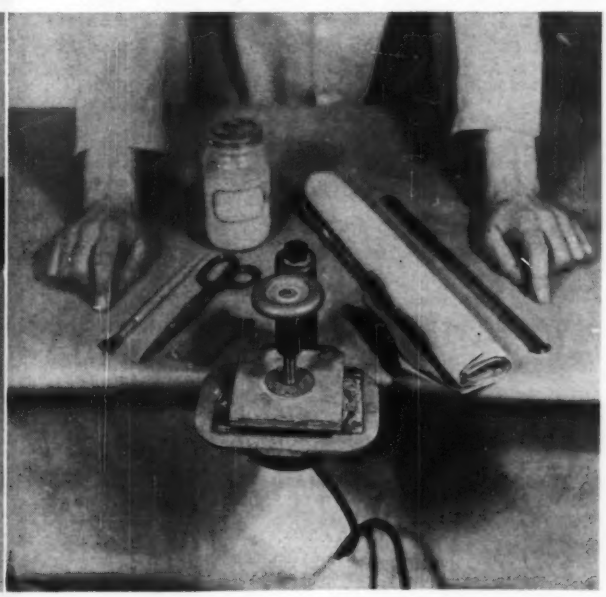
Mounting the die—Saw mounting strip to length, sand, and stain cut end. Drill hole for handle and insert handle, using glue. Attach die to sponge rubber with rubber cement.

For best results, the following hints are offered: Do not rush or take short cuts. Make sure the original type is perfect. Keep consistency of compound fairly thick. Do not attempt to make the die with an imperfect mold. Check time and temperature carefully throughout entire operation. Have materials prepared and available beforehand. Be safety conscious.

On successful completion of this process, you will not only have a rubber stamp to use but will have accomplished an objective of industrial-arts education—to develop in each pupil an interest in industry and how consumer products are made. ★

Making an impression (left) using an arbor press and vulcanizing the die (right). Vulcanizing is the basis for the process described.





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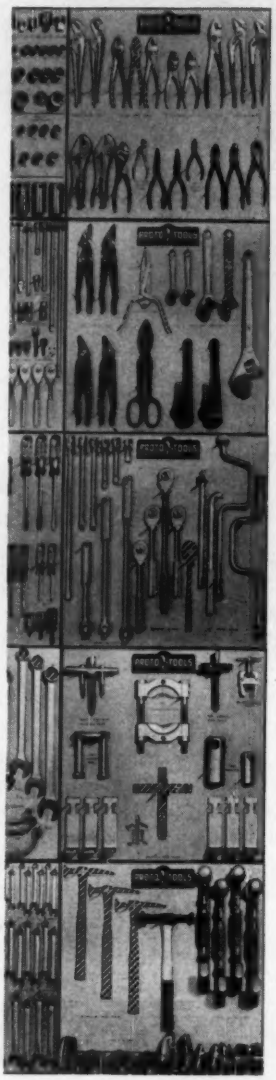

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happenings in industrial education

Additions in Georgia

NEW construction projects have recently been completed at both North Georgia Trade and Vocational School, Clarksville, and South Georgia Trade and Vocational School, Americus. Three new buildings have been built at both institutions.

At the North Georgia School, the new buildings include an electronics building housing six shops for electricity, radio, TV, and electronics. The ground floor will be occupied by the builders-trades shops.

At the South Georgia School, the new buildings include an electronics building and an automotive building.

A fourth new building is in the planning stage at North Georgia. It will house shoe repair, office training, assembly room, watch and jewelry repair, cosmetology, practical nursing, and mechanical drawing.

Connecticut Conference

"INDUSTRIAL Arts in the Scientific Age" is the theme of the 26th annual spring conference of the Connecticut Industrial Arts Association, to be held May 1-2 at the Teachers College of Connecticut, New Britain.

The program will include talks by James Strickland, Massachusetts Institute of Technology, and Ralph E. Keirstead, Connecticut State Department of Education. A student project fair will be held in conjunction with the conference.

IAA Goes to Mexico

FOR the first time, Mexico this year will be included in the annual Industrial Arts Awards program sponsored by Ford Motor Company.

Company officials in charge of the competition state that the Mexican program will be closely tied in with the American IAA competition but it will operate independently.

The top award-winning projects from Mexico will be sent to Dearborn, Mich., this fall to be displayed alongside the outstanding entries submitted by participants in the U.S. competition. Four Mexican students and their instructors also will come to Dearborn in a three-day "Winners Week" holiday.

Counselor for the Mexican program is José Avila Garibay of the Mexican education ministry.

Utah Convention

A STATE-WIDE student project contest, a teacher project idea competition, demonstrations, and discussion seminars featured the 10th annual Spring Industrial Arts Convention, held April 18 at Bountiful High School, Utah.

Marshall L. Schmitt, specialist for industrial arts, U.S. Office of Education, spoke at the opening session on "Contribution of Industrial Arts to Mathematics and Science."

Wendell J. Peterson of West Jordan

Convention Calendar

Wisconsin Association for Vocational and Adult Education, Northland Hotel, Green Bay, May 1-2.

Connecticut Industrial Arts Association Spring Conference, Teachers College of Connecticut, New Britain, May 1-2.

Oswego Industrial Arts Spring Conference, Teachers College at Oswego, N.Y., May 7-8.

Georgia Vocational Association, Biltmore Hotel, Atlanta, June 11-12.

Colorado Vocational Association, Colorado State University, Fort Collins, June 15-19.

Virginia State Vocational Conference, Virginia State College, Petersburg, June 22-26.

Pennsylvania Vocational Association, Eagles Mere Hotel, Eagles Mere, June 23-25.

Louisiana Vocational Association, Capitol House, Baton Rouge, Aug. 13-17.

Industrial Arts and Trade and Industrial Education Conference, Virginia Polytechnic Institute, Blacksburg, Aug. 17-19.

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TABLE IS of hard maple with birch paneling, and fitted with heavy pipe footrail, constructed to give years of service in schools. Top is fitted with pencil ledge and B/G tamper-proof mechanism. Overall size: 48" w. x 32½" d. x 39¾" h. Finished natural and shipped ready to use.

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Junior-High School is president of the Utah Industrial Arts Association. Other officers are: Russell Stephenson of Bingham High School, vice-president; and Clement R. Nickle, Mt. Jordan Junior-High School, Sandy, secretary-treasurer.

Action Research

IN an effort to bring industrial arts in closer relationship with the sciences, two graduate students at the University of Miami, Fla., are conducting action research with junior-high and senior-high school industrial-arts students.

The students, both full-time industrial-arts teachers in Dade County, Fla., are working under the direction of J. R. McElheny, professor at the University of Miami.

Contributing to the development of the project was a report by Michael Paca in SCHOOL SHOP (Feb., 1959).

Texas Study Group

THIRTY Texans have been named as members of the Texas Education Association curriculum study commission of vocational education and industrial arts in Texas elementary and secondary schools.

Bascom B. Hayes, superintendent at Brazosport, is chairman of the commission.

New Building at Denton

A NEW building to house the industrial-arts department at North Texas State College, Denton, is expected to be completed and ready for occupancy in May.

The main floor of the new building will contain offices, a conference room, and laboratories for woodworking, machine shop, sheetmetal and welding, pattern making and foundry, and power mechanics. The second floor will contain laboratories for general crafts, graphic arts, and general shop, in addition to drafting rooms, lecture rooms, an audio-visual room, six offices, and an industrial-arts reference library. The building will be air conditioned and the laboratories on the first floor will be equipped with exhaust systems and heating and ventilating systems. ★

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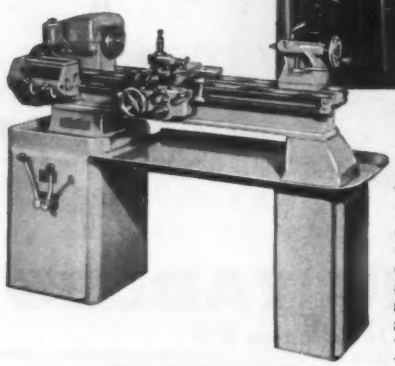

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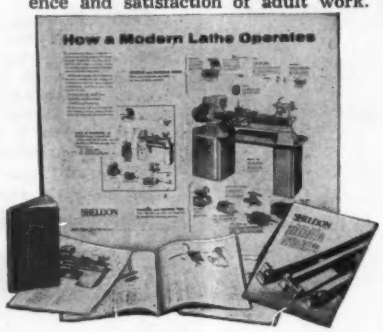

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WILLIAM C. KNAAK, formerly vocational coordinator at White Bear Lake, Minn., is now assistant state director of vocational education for Minnesota.

WALTER BARTZ, supervisor of trade and industrial education for Illinois, has also been named chief of the newly established Technical Education Service. In his new capacity, Mr. Bartz will devote part of his time to the development of technical education in Illinois.

The new consultant in industrial arts for the Georgia State Department of Education is CHARLES GINN, JR., not Raymond Ginn, Jr., as reported in the December issue of SCHOOL SHOP.

E. W. SOPER, formerly of Cerritos Junior College, Norwalk, Calif., is now assistant supervisor of T & I teacher training at University of California, Los Angeles.

RICHARD HEGMAN has been appointed mechanical drawing instructor in the T & I Division at Ferris Institute, Big Rapids, Mich.

TREVOR GENE HOWE is a new woodworking instructor at Iowa State College, Ames.

JOHN M. POLLOCK, who recently returned to the U.S. after serving three years in Nicaragua supervising the organization of shops and development of industrial education there under the ICA, is now a member of the industrial-education department of Southern Illinois University, Carbondale.

JAMES LAHREN is now a graphic-arts instructor at Moorhead State College, Minn. ★

Designed with beginners in mind

Memo Pad

By Bob Reeves

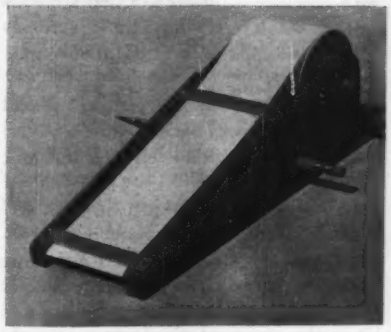
Chula Vista, California, Junior-High School

INDUSTRIAL-ARTS teachers who are looking for a simple and practical project for beginners in woodworking or general shop should try this memo pad. There are no complicated construction processes involved, yet when it is completed the student should have a project that he and his parents will welcome into their home.

Start the construction by cutting the sides from ½" pine. For the sake of economy, try laying out the stock so that one diagonal cut can be made between both sides. After the sides have been properly shaped and smoothed, place them together and drill holes for the dowel and the pencil holder through both pieces.

Cut the Masonite to size, sand the edges, and round the top corners slightly. Assemble the Masonite with the sides by gluing and nailing with small brads. Where the nailing must be done near the thin end of the sides, it may be necessary to clip the brads off short enough so they do not go all the way through.

The guide strips are made of 22 gage aluminum cut to proper size. The ends can be bent to shape with pliers or they can be bent over a wooden, or metal, form. The holes at each end of the strips can be punched with a nail or any sharp pointed instrument. File the corners and edges smooth, and then buff to a high polish.

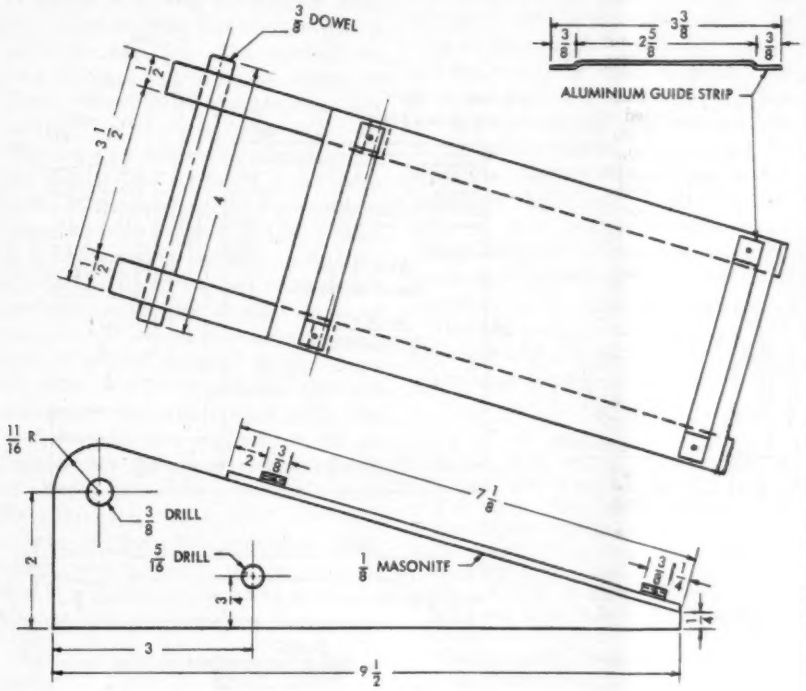


A memo pad that can be made by beginning, junior-high-school industrial-arts students.

Cut the ⅜" dowel to length, sand the ends round and smooth. Then apply one or two coats of clear sealer.

Before nailing on the guide strips, the assembled sides and top should be painted with two coats of some bright colored enamel.

The paper supply for the memo pad is a standard roll of adding-machine paper. Be sure to get the roll that is 2½" wide. ★



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Hexagon-Handled Screwdriver

By Charles F. Martinetz

Samuel Gompers Vocational-Technical High School, Bronx, New York

THE hexagon-handled screwdriver is a machine-shop project that students like to make, especially those students who do not follow a straight machine-shop course.

The project is the first to develop skill in turning between centers. Students also learn not to score and burn off tailstock centers.

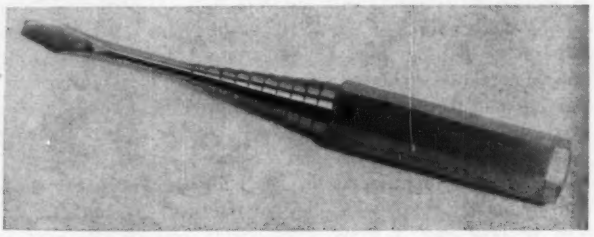
It is an excellent project to make students think of diameters and length dimensions. The students practice turning down the ten diameters to micrometer size; to smooth the surface with a tool bit is also required. Students are taught to leave each diameter .001" oversize and to later polish down each diameter with fine emery cloth to the correct dimension. The ten length dimensions are measured with a hermaphrodite caliper.

Before tap drilling the 13/16" hole, 3" deep in the handle, students are instructed to stamp their full name, tool number, and machine-shop room number into the flats of the hexagon handle. The 13/16" hole lightens the handle and provides a chamber for holding screws. The hole is tapped with a 7/8-14 N.F. tap, 3/4" deep, into which the cap is screwed.

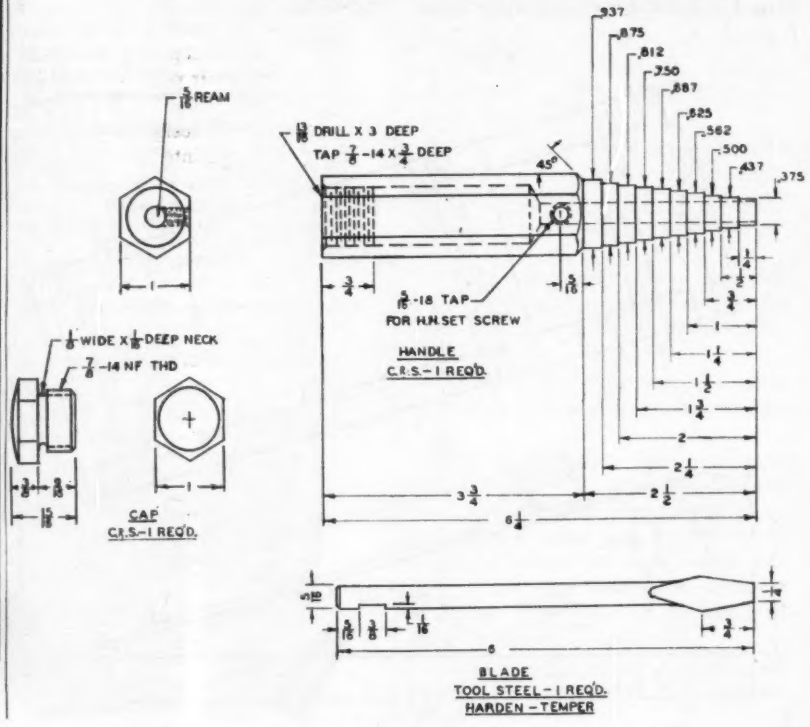
The other end of the handle is reamer drilled 19/64" until it breaks through to the larger 13/16" hole. It is then reamed 5/16".

The screwdriver blade is made from 5/16" drill rod, forged, shaped by filing, hardened, and tempered. A 5/16" N.C. Allen cup-head set screw, 3/8" long, is used to hold the screwdriver blade at the filed flat.

Students are advised to have the handle and cap chromium plated to prevent rusting. ★



This hexagon-handled screwdriver (right) is designed to give students practice in a number of operations in the machine shop.



Maze . . . . . from page 7

scribed. They assume a rat is capable of making multiple responses and exhibiting varied behavior. Consequently, a more typical rat-experiment maze has blind alleys, multiple barriers, cul-de-sacs, alternate routes, and other hazards, each a challenge to the rat's learning ability. Rats have learned, for example, to take the shortest route of three paths toward a goal. And, under experimental conditions with alternate paths blocked, rats will run the shorter of the two paths still open.[4*] They will follow the long path toward the goal only when the shorter routes are closed.

Undesirable as it may appear, the rat that is confronted by multiple paths leading to his goal—with opportunities for exploration, decision making, and problem solving—is presented with greater challenges for *its* level of intelligence than are students who must learn within the limits of a fixed series of projects. The experiments of Skinner,[3] Guthrie,[1] Tolman,[4] and Hull,[2] report efforts of psychologists to adjust learning situations to the level of intelligence possessed by the learner. Naturally each psychologist describes the behavior, and the reasons for the behavior, in somewhat different terms (some do not use the word "intelligence," for example) but each has designed tasks that in some measure *challenges the potential* of the "student."

Students Deserve Challenges

Some of you might resent my analogy of the rat in a maze and students doing prescribed projects. Nonetheless, the implications are clear. The psychologist, who works with rats in his attempt to discover how the lower organisms learn, invariably presents challenges to his rats that are more consistent with their potential than are the challenges some industrial-arts teachers provide their students whose potentials are infinitely greater. It is embarrassing, regretful, and unforgivable that by our actions we imply our students are capable of only low-order responses. If we desire intelligent action and productive thought[5] in our shops, we must structure a situation that will encourage, nay, require such action and such thought. Our students should get consideration at least equal to their levels of ability, just as the psychologist challenges his rats.

Some teachers have committed themselves, presumptively, to the principle that it is foolish and a waste of time to suggest that *their* students can engage in effective problem solving in the shop. They will point out that their students must be literally (if not physically) led by the hand and shown, step by step, what to do. It is not unusual to hear one of these teachers deplore the fact that "my students can't think for themselves," and then immediately turn to hand a student "Number Three" in the sequence of preplanned projects.

It seems rather obvious that students will not learn to do independent thinking unless they are provided learning situations that compel independent thinking. Regardless of what we *say*, our students are learning (or what the syllabus states they should be learning). They are, in fact, *learning to do what they do.*

No "Runway"

I hope when my youngsters enrol in industrial-arts classes some 10 years from now, they will not be subjected to a single-path "runway." I hope, too, their instructor will realize that all students have intelligence, but that some are a bit slower, or faster, than others. I hope there will be many "runways," complete with challenges and thought-provoking situations. In essence, I hope my children encounter a learning environment commensurate with the abilities and potential of human beings, and not the single, narrow "runway" that is, after all, somewhat beneath the capacities of even the rat.

Our students are capable of becoming ego-involved in their activities. They are capable, too, of being motivated by intrinsic as well as extrinsic goals. Furthermore, they are capable, unlike the rats, of planning their personal "mazes." All students, to a lesser or greater degree, are capable of designing their own projects and making intelligent decisions in an infinite number of situations. To place one's faith in this method, as contrasted to the idea of fixed, "canned" projects, is to confess that we should design learning activities to meet the needs and to challenge the potentials of humans.

Humans are a far cry from a rat who can only run a maze, not share in its planning or construction.

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3. Skinner, B. F. *Science and Human Behavior.* New York: Macmillan, 1953.
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5. Wertheimer, M. *Productive Thinking.* New York: Harper, 1945. ★

*Numbers refer to bibliography at end of article.

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Diamond Dust

Abrasive comments from that doughty Scot, Tom Diamond, former head, Department of Vocational Education, University of Michigan, Ann Arbor.

He Knows His Onions!

SAM teaches industrial arts and, from all reports, he has functioned satisfactorily in his present position for a long time. We had occasion to visit him a few years ago, and we found him to be in the lower depths of despondency. He is a mild sort of chap as a rule, but when we invited him to share with us the cause of his misery, he launched into a tirade on one of the many afflictions of his profession. This is the story as we understood it.

Apparently Sam's supervisor, who in Sam's mind was an old fuddy-duddy, was hipped on the quaint notion that his teachers needed to be upgraded. There are those who are of the opinion that this upgrading business is a function of the teacher trainers who are housed comfortably in our institutions of higher learning. But Sam's immediate superior seemed to feel that he had some responsibility in the matter. This weighed so heavily on his mind that he had come to the conclusion that he should do something about it. This he did with such enthusiasm that Sam began to feel that he was being imposed on.

This imposition started a few months after Sam was appointed when the supervisor asked him to work out all of the problems in the high-school drafting course. The results of this effort was to be submitted to the supervisor for his approval. This wasn't so bad, since Sam liked drafting. And, since he was new on the job, he felt it would be good policy to do as he was asked.

When he had finished this assignment, it was suggested that he elect an evening course in an area of industrial arts other than the one in which he was teaching. Again Sam responded by spending three evenings a week in the areas of electricity, graphic arts, and machine shop. Each of these classes ran through the winter so, during that period of three years, Sam had little time to spend with his family.

Then one day an itinerant teacher trainer from the state university appeared in the school. Since he proposed to offer a course for university credit, Sam was advised to enrol in it. This course lasted through the first semester, and appeared to be so successful that a second course was offered during the second semester. Sam, being a bear for punishment, enrolled in it also. So, for another year Sam's evenings were spent in class, or in the local library, working on his assignments.

During these years, Sam's supervisor, who was an avid reader of his professional magazines, kept bringing articles dealing with Sam's type of work for Sam to read, and suggesting that Sam report to him on his impressions of them—all of this, too, in addition to the evening responsibilities Sam had assumed!

Recently we visited Sam again, and we found that he had been promoted to the position of assistant supervisor. Now his whole attitude toward the upgrading of teachers had changed. He had come to the conclusion that the individual he had classified as a fuddy-duddy was a wise member of the profession.

He had not realized that most people in supervisory or administrative positions are constantly on the outlook for young men who have potential ability to carry responsibility. When they find such a person they test him by assigning to him some minor administrative duties. If the individual's reaction to these assignments is what they hoped for, they

(*Continued on page* 23)

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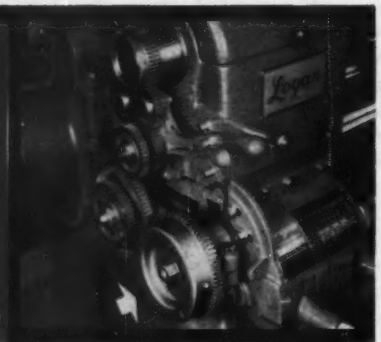

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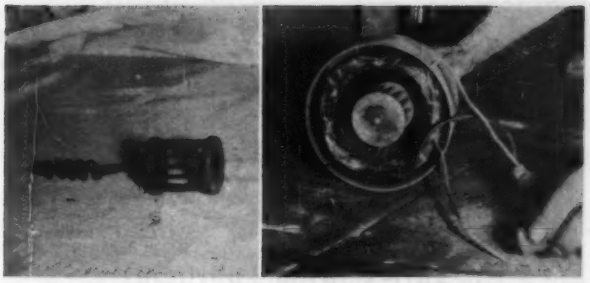
For indicating motor rotation

Squirrel-Cage Rotor

By Harry J. Miller

Bok Vocational School, Philadelphia, Pennsylvania (on leave)



The squirrel-cage rotor (left); how it fits inside of an electric motor (right).

THERE are a number of top-grade, down-to-earth lessons for students of vocational-school electrical classes in making this rotation indicator. Should the student later enter the employ of a shop doing motor rewinding, possession of the device, variations of which are used by motor shops across the land, will indicate he has a working knowledge of motor characteristics.

Where, as part of its practical electrical program the school teaches motor winding, whether this be fractional horsepower like the small motors involved in household appliances or where instruction includes polyphase orientation, it is always a problem, in the absence of specialized knowledge, to know just which way the motor will revolve after it has been rewound.

In such cases, the student will assemble the rewound motor, only perhaps to discover it operates in an unwanted direction. While this may be corrected in a variety of ways, this "gismo" saves time and indicates if the student has made a perfect rewind job, or if it is open or short-circuited at any part.

To use, the squirrel cage is poked inside the open stator of the rewound motor, before the end bells are assembled on the machine. Holding the handle of the device, current is applied momentarily to the windings. If the windings are free of shorts or grounds, the free-wheeling little squirrel cage will revolve, and its direction is the direction in which the motor rotor will turn.

A short-circuited, or open, coil will keep the cage from turning, thus indicating these faults long before the motor has been assembled.

The squirrel cage consists of two end discs of copper, 2¼" in diameter, through the centers of which pass a steel wire shaft brazed to the handle end. The shaft is threaded at one end to take a nut that locks on to the outside disc.

In between the two discs are brazed—or soldered—a series of #9 bare wire rods, 2⅞" long, spaced at intervals of ½" around the perimeter of the copper discs. The end of the steel shaft is

(*Continued on page* 24)

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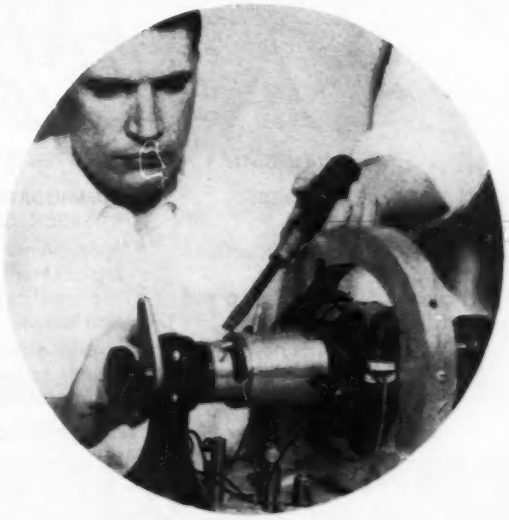

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Diamond Dust .... *from page 20*

may not mention the fact, but they arrange matters so that the individual can be trained for the position he seems to be fitted for.

The fuddy-duddy knows his onions; so, when the old so-and-so seems to be picking on you, he may not be malicious about it—he may be grooming you for bigger and better things! ★

School Involving ... *from page 9*

the following year's all-school project.

Metal Shop.—The metal shop supplies the necessary metal work requested by the vocational-carpentry instructor. These students also visit the house to observe conditions and problems of construction as they affect sheetmetal work.

Welding Shop.—The welding class supplies any welding needed for the proj ect house of their school.

Wood Shop.—The wood-shop instructor keeps all wood-shop classes informed about the possibilities and advantages of the vocational-carpentry program. He takes his students on visits to the building site to watch the vocational-carpentry students in action. In turn, the vocational-carpentry class relies on the wood-shop classes for a supply of students for the house program.

Handicraft Classes.—These classes furnish items to be displayed as part of the interior-decorating scheme. They work with the homemaking department selecting these items.

Electrical and Radio Classes.—These classes have the responsibility of wiring the house. They check the plans to see that the house is adequately supplied with outlets and lights, order needed supplies, and install the rough and finished wiring and fixtures. These classes have their work closely coordinated with that of the carpentry class. They have to plan their work very carefully so that they do not hold up construction.

Agriculture Class.—The agriculture or horticulture class supplies plants for inside planters of the house its school is building. The students also landscape the grounds around the house for the "open house" and maintain the grounds during the time the house is open for inspection and sale.

Printing Class.—The printing class works with the vocational-carpentry instructor, the senior-problems classes, and art department in developing and printing communications media for the house project. This material ranges all the way from the "For Sale" sign to illustrated brochures and invitations to the "open house." This phase of the operation is overseen by the industrial-education coordinator to make certain the information is correct and that deadlines are met.

Homemaking Department.—Planning the interior decoration of the house is the responsibility of the homemaking department. Students select paint for the house—inside and outside—and select the wallpaper and floor coverings. They work with furniture stores in selecting furnishings. They also take care of the house during the "open house" period by keeping it clean, watering the inside plants, and serving as hostesses.

Still More to Come

Journalism Class.—This class does the "press agentry" for the project. They furnish local newspapers with publicity material—copy and pictures. They even make contact with national professional and consumer publications, hoping to spread the story of our three house-building projects across the land.

Senior-Problems Class.—This class creates the messages for the brochures, invitations, pamphlets—and the "For Sale" sign—that are all part of the project. They also investigate zoning restrictions in the area, check prices of

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lots, look into cost of placement of the house insurance, and find out the charge for any necessary improvements on the property.

Art Department.—This department designs and makes all of the outside signs needed. They also work with the architectural-drawing class on the design of the house, and with the agriculture class on landscape problems.

Business Education. — Bookkeeping students maintain time records and cost accounting records of funds spent. These students also do the duplicating and typing that is needed.

Photography Class.—Needless to say, this group photographs the job. They take pictures of the job as it progresses, for educational purposes, and photos when it is completed, for publicity reasons.

Math Department.—This department uses the house project to dramatize real math problems. They compute the lumber list, in terms of quantities of particular woods needed. They also compute the number of shingles needed for roofing, the amount of Formica and asphalt tiling needed. Figuring the cost can also be done in this department.

Science Department.—Students learn the properties and reasons for using particular kinds of building materials. They learn about the exact treatment given some kinds of lumber and why different roofs last longer and are considered better than others. The same analysis can be developed around siding. Structural stresses can also be calculated.

With these eighteen different types of classes working together as a team, a product is made that involves a good portion of the school. Many classes not listed also use the house project as a means of learning their subjects in a more practical way.

The departments concerned with this project become aware of each other's problems and they tend to grow closer together and realize that they each have an important part to play in the total educational program. This creates a healthful atmosphere in the school for both teachers and students.

Staff members in the Whittier Union High School District feel the experience gained by the many students who participate in its "School-Involving Project" are the kinds of experiences that will remain with them once they leave high school and enter a vocation. ★

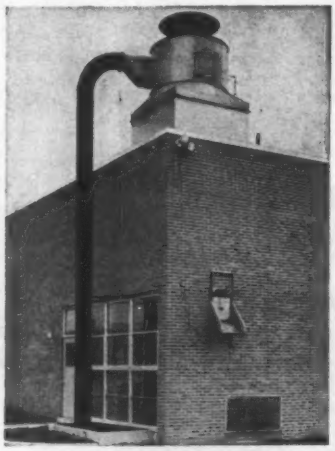

Photo above shows collector on shop roof and scrap discharge door in side of building. This unique system at the Carlisle Senior High School, Carlisle, Pa., accommodates all dust and scrap from the shop shown at right. All piping is below floor level under grating to best utilize all available working space, and to give the students maximum visibility and freedom of movement around machines.

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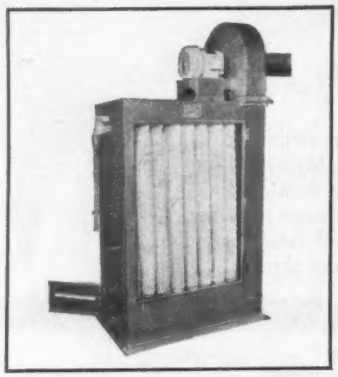

This OBP portable unit is complete with exhauster, motor and filter bags. Dust which is picked up from machines is deposited in a storage compartment and the clean air is returned to the shop.

OHIO BLOW PIPE CO.

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Rotor . . . . . *from page* 21

twisted to form a 6″ long handle.

Aside from the fact that the student may take with him a piece of his own handicraft as a tool of the trade he may elect to enter, making the indicator is also an excellent opportunity for the instructor to stabilize a student's knowledge of magnetic induction and the principles of motor operation. A difficult lesson to get across is to show a class a conventional and complicated wound, or unwound, rotor abstracted from a motor. It may take many explanations before the student understands just what electrical principles are involved in the rotation of an armature. The fact that this simple device will revolve under the impetus of the magnetic field makes the teacher's explanation easier to grasp.

It is also of value in orienting students to motor principles, if these are first taught with even a simpler device than the squirrel-cage unit described here.

By poking a hole through both ends of an empty tin can, inserting an iron rod all the way through the holes, and then placing the unit inside a motor stator, another teaching aid can be devised. By turning on the current, the tin can will revolve and start to heat.

Thus, the problem of explaining both of these aspects of electric current is reduced to a minimum of required understanding. ★

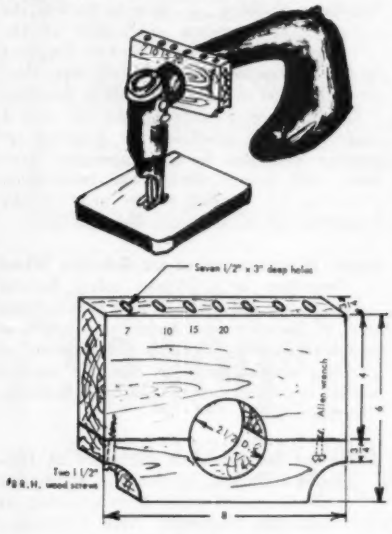
KINKS

Payment will be made for each Kink published. Send to Editor, School Shop, Ann Arbor, Mich.

Tool Markers

An aid to identifying tools by name is a tag made of poplar, pine, bass or some other blonde wood. It should measure ⅛" x ¾" x 3". Shellacked thoroughy, it will take India ink for the tool's name and, if you feel ambitious, a description of the tool and its function could go on the side opposite the tool's name. You should have one for each tool.—*Donald Kinnaman, Camelback High School, Phoenix, Ariz.*

Jig-Saw Blade Holder



JIG-SAW BLADE HOLDER

Above are illustrations of a jig-saw blade holder that I have made and which we have found to be very handy. The top drawing shows where it fits around the neck of the saw and the bottom drawing shows its simple construction.—*John H. Simonson, Wayne, Mich., Memorial High School.*

Finish for Bench Tops

We have developed an easy and inexpensive way to put a finish on new bench tops in our shop. The procedure follows:

Apply two coats of fiberglass resin with a short-nap paint roller. (To do six tops, we used a quarter of a gallon of resin and 30 minutes per coat for the six tops.) Smooth out any bubbles with a medium-grade sandpaper and finish the job with a fine steel wool.

In the case of older bench tops, merely sand the surface thoroughly with a belt sander to remove the present surface and proceed as above.

We have discovered that we now have the hardest finish possible and when it is scratched or nicked it needs only light sanding and steel wooling to return it to its high finish.—*Maynard McMahon, Red Bluff, Calif., High School.*

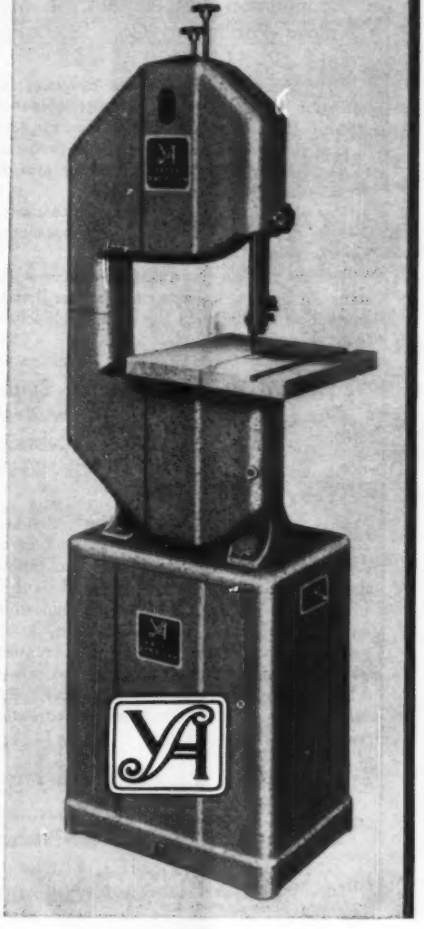
Lubricant Chart

To prevent shop students from selecting the wrong drill lubricant when drilling, a simple chart showing the correct type of lubricant for the job should be hung on the wall next to the drill press.

The chart should include the following information: Use soap and water for drilling holes in steel up to ½". Cutting oil is used to drill holes in steel over ½". Cast iron, plastic, and nonferrous metals need no lubricant. Turpentine is used for drilling glass. Machine oil retards the cutting power of the drill.

Labeled squirt-cans of different sizes and shapes with various types of lubricants will help make selection—and use—easier.—*Louis Enos, Lincoln Junior-High School, Sacramento, Calif.* ★

Modern, Rugged 14" Band Saw



Heavily-ribbed, one-piece frame eliminates vibration and provides sturdy support for work. Adjustments for table tilt, wheel tracking, blade tension, guide placement and changing blades are made from operator's position. The table, supported by double trunnions, tilts 45° right and 10° left. A spring-loaded stop pin quickly resets the table at 90°. Aluminum wheels are covered by hinged doors, and the blade is completely guarded except at point of cut. $191, less motor and controls.

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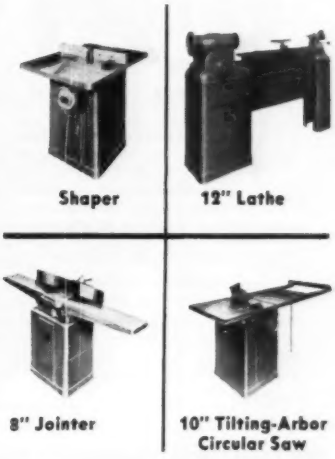

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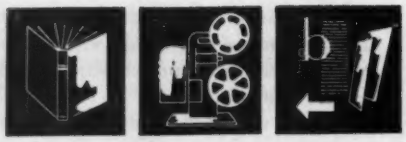

instructional Resources

Books:

Woodworking for Industrial Arts. Madden. Chicago: Goodheart-Willcox Co., Inc., 1959. Pp. 224. $4.00.

This book contains basic information about tools, woods, and finishing materials used in productive shop work.

It presents a wide selection of projects by means of detailed drawings and photographs, as well as covering basic tools and processes. It is designed to assist pupils in developing patience, exactness, and pride in good craftsmanship.

While the book is intended to be an aid in the development of woodworking as a shop project, it will be received with enthusiasm by hobbyists as well.

Ira C. Madden is an instructor in Crary School, Detroit, Michigan, and a consultant in industrial arts at Wayne State University and the University of Michigan.

Applied Drawing and Design. (4th Edition.) Scrogin and Bettencourt. Bloomington, Ill.: McKnight & McKnight Publishing Co., 1959. Pp. xiii+254. $4.60.

This revised edition includes technical information on each of the special fields of drafting. It covers 172 definite problems to save the teacher time and effort. These problems do not call for copy work, but rather provide exercises in thinking and planning.

Over 500 illustrations are included to clarify the text and to suggest methods of approaching each problem.

Everett Scrogin is a draftsman and designer in Seattle, Washington. William Bettencourt is an instructor in the senior-high school in Belmont, Mass.

Vocational Education in the Space Age. Buffalo: Western New York School Study Council, University of Buffalo, 1958. Pp. 128. $3.00. Paper Bound.

This is a report on a workshop which was conducted at the University of Buffalo in August, 1958. A number of leaders in various fields were invited to attend and express their ideas on future trends in vocational education. These visitors included a sociologist, a scientist, a school administrator, representatives of labor and of industry, and several others. The result is this report which contains stimulating ideas that forward-looking educators will profit from reading.

General Shop Handbook. (2nd Edition.) Willoughby and Chamberlain. Peoria, Ill.: Chas. A. Bennett Co., Inc., 1958. Pp. 160. $1.64.

This is a comprehensive text which covers instructional units in the elementary phases of drafting, woodworking, metalworking, plumbing, finishing, concrete work, electrical work, plastics, and leatherwork. It also has sections in tool care, doors and windows, and ropework, as well as study guides or tests for most of the units.

The general-shop teacher will find this book to be most helpful in teaching where many activities are going on at the same time.

George A. Willoughby and Duane G. Chamberlain are members of the teaching staff in the department of industrial education and applied arts at Eastern Michigan University, Ypsilanti.

Pamphlets:

Apprentice Training . . . How to Do It is the name of a recent publication of the American Foundrymen's Society. Prepared by the Apprentice Training Committee, Education Division of AFS, the booklet describes a sample apprentice-training program with a suggested work schedule, the foundry apprentice workshop, foundry apprentice classwork, and related study. For information regarding the booklet please write to the Society at 201 N. Wells St., Chicago, Ill.

Safety Recommendations for Grinding Wheel Operation is a 24-page safety booklet published by the Grinding Wheel Institute. It discusses such technical subjects as peripheral speeds, strength classification of grinding wheels, etc. It is available free by writing to the Institute at 2130 Keith Building, Cleveland, Ohio.

Guide for Industrial-Arts Education in California (Revised Edition) is a 39-page, well illustrated publication prepared by the California Industrial Arts Curriculum Committee. The publication briefly describes the elements of the industrial-arts program and offers a framework that should be interpreted and applied in terms of the curriculum and facilities offered by a local school district. Available for 40¢ from the California State Department of Education, Sacramento, Calif.

Audio-Visuals:

Engineered Screw Machine Tooling Applications is the name of the new 16mm, sound, color film—running time is 35 minutes—produced recently by the Brown and Sharpe Manufacturing Company. The film features eight practical applications of the latest design automatic screw machines. The film is available on a free-loan basis from the firm's Machine Tool Division, Providence 1, R.I.

The Miller that Uses Its Head is a 20-minute movie that shows the range of applications of the Nichols milling machine. The movie is 16mm, color and sound, and shows slotting, straddle milling, plunge milling, face milling, and end milling. The film is available on a free-loan basis by writing to The Robert E. Morris Company, West Hartford 7, Conn.

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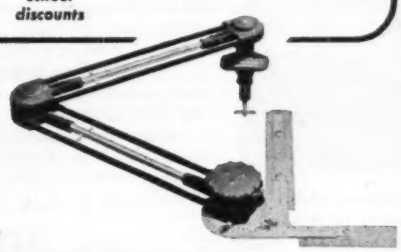

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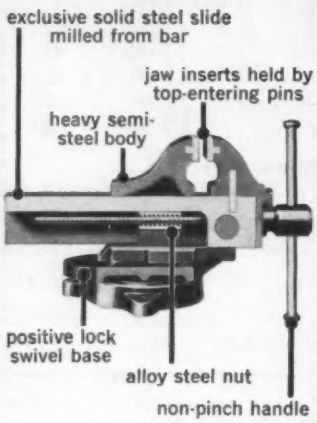
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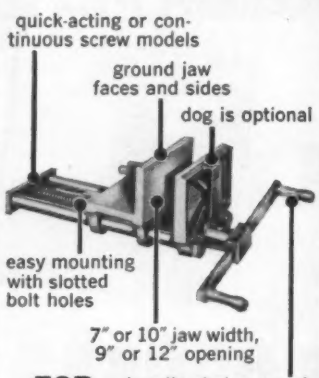
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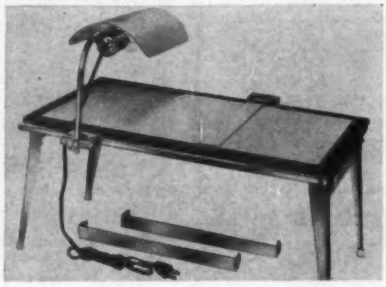
news from Industry

(Circle the numbers on the card in this issue to secure the items listed.)

Heyer Corp. Introduces All-Purpose Scope

The Superscope is an all-purpose scope, recently introduced by The Heyer Corporation, to provide the proper surface and light for drawing, lettering, ruling, and writing on stencils, spirit and gelatin masters, and paper offset plates.



The Superscope can also be used for retouching negatives, the company states. It is portable and can be folded for convenient storage. It can be used in a standing position with all legs extended, or the front legs can be folded under to support it at the best angle for proper working conditions.

An adjustable light, a plastic sliding T-square, and spring-steel clamps to hold the material in place are included with the Superscope. Both light and T-square lock firmly in position, the company asserts.

For more information write the manufacturer, 1850 S. Kostner Ave., Chicago 23, Ill., mentioning SCHOOL SHOP; or *circle no. M-1 on the business-reply card.*

Height-Slant Control on New K & E Scriber

A new Leroy Scriber that can be adjusted to form template characters of varying heights and slant angles without changing character width is now available from Keuffel & Esser Co.

The new addition, the company states, can form characters, either vertical or slanting at any angle up to 45° forward, and any height from 60 to 150 percent of the size of the figures represented on the drawing template used. Height-slant adjustment is by means of the large center knob.

The Leroy Height and Slant Control Scriber takes pens from -0000 to -8 nd it can be used with Leroy Lettering Templates up to size -500 C.

For more information write the manufacturer, Adams and Third St., Hoboken, N.J., mentioning SCHOOL SHOP; or *circle no. M-2 on the business-reply card.*

Seco's VTVM Model Said To Be "Fool-Proof"

Seco Manufacturing Company claims its new Model 208 is a "fool-proof" VTVM which offers accuracy to within 3 percent on all scales.

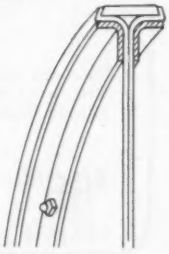
The new model features a large, easy-to-read 4½", 200-micro-amp meter mounted on a sloping meter panel. It provides 7-dc, 7-ac, and 7 ordinary ohm ranges, plus a special RETMA (EIA) ohm scale to check standard color-coded resistance values and tolerance limits.

The company states that Model 208 incorporates a specially designed "shift-lever" type function switch with all functions clearly marked and cleanly separated by positive stops for each position.

The new unit is compact in design, measuring 5½" wide x 8½" long x 3½" high.

For more information write Seco Manufacturing Company, 5015 Penn Ave. S., Minneapolis, Minn., mentioning SCHOOL SHOP; or *circle no. M-3 on the business-reply card.*

Reinforced Band-Saw Wheels Introduced by Carter



The development of new reinforced wheels for band saws and band resaws has been announced by Carter Products Company, Inc.

The company states that the rims of these new heavy-duty wheels are reinforced with a double thickness of quality steel to make them five times stronger. The wheels are also said to offer new dynamic balancing for vibrationless operation at any high speeds.

For more information write the company, 50 Market St., N.W., Grand Rapids, Mich., mentioning SCHOOL SHOP; or *circle no. M-4 on the business-reply card.*

Swaptops Work Tables Designed for Adaptability

A new line of work tables, called Swaptops, has been announced by Johnson Products, Inc.

Swaptops are said to be designed to provide great adaptability so they can be used singly

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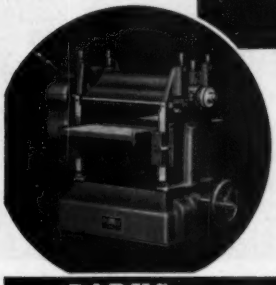

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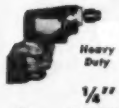

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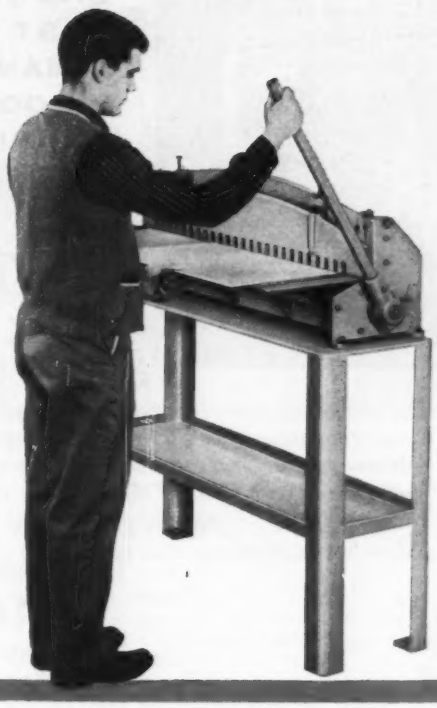

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Fred A. Koertge, Industrial Arts Instructor, Refugio High School, Refugio, Texas, says: "The Torit Dust Collector is very efficient, not noisy, and is very clean. The three machines serviced are a 20" planer, 20" band saw, and 10" jointer. There are gates in the pipeline at each machine and they can be opened or closed separately."

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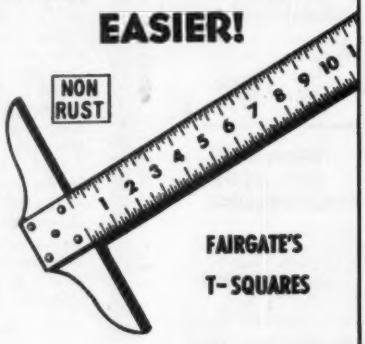

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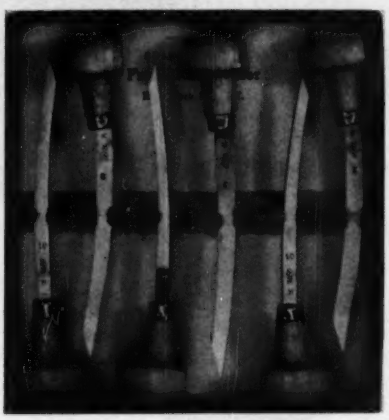
For more information write the company, Wilton, Conn., mentioning SCHOOL SHOP; or *circle no. M-5 on the business-reply card.*

Frank Mittermeier Adds Set of Six Gravers



The set of six gravers recently added to the line of the Frank Mittermeier Company, consists of two round, 3 and 10 mm; two flat, 2 and 10 mm; lozenge, 3-mm wide; and a knife.

The company states that the gravers are slightly bent for clearance of the hand and to make it easier to work on curved surfaces. They are said to be particularly suitable for wood-block cutting, engraving, and general-utility use.

For additional information write to the firm at 3577 E. Tremont Ave., New York 65, N.Y., mentioning SCHOOL SHOP; or *circle no. M-6 on the business-reply card.*

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The Windhaven Radio Company has introduced the Windhaven Speaker System Kit that can be powered by a table-model radio, TV set, record player, or hi-fi system.

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For more information write the company, P.O. Box 74, Baroda, Mich., mentioning SCHOOL SHOP; or *circle no. M-7 on the business-reply card.*

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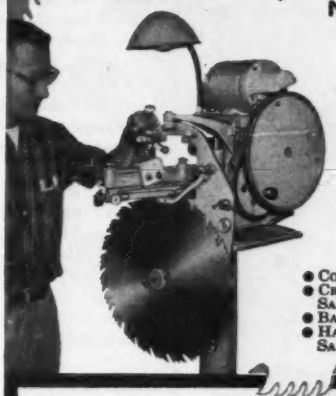

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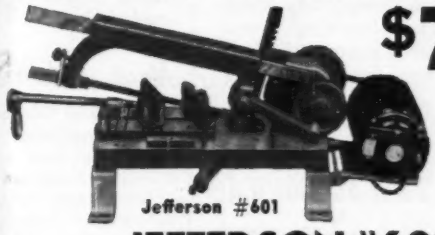

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The wheel, which is portable (weighing only 85 pounds), is designed so that a person can sit while throwing. The company states that this feature makes it especially useful to pupils who cannot reach or control ordinary wheels.

Variable speeds are said to be available on the wheel, ranging from a neutral free spinning position to 180 rpm. The drip pan, which has a 15" diameter by 4", is removable for easy cleaning. The wheel head is 12" in diameter and is made of aluminum.

For more information write Seeley's Ceramic Service, 7 Elm St., Oneonta, N.Y., mentioning SCHOOL SHOP; or *circle no. M-8 on the business-reply card.*

Craftool "Dust Boy" Equipped with 14-Gallon Drum

The shop-vacuum and dust collector recently introduced by Craftools is equipped with a 14-gallon-capacity drum and a ½-hp motor.

Said by the company to be "extremely" portable, Dust Boy is equipped with a 2½"-diameter hose; fittings are of heavy, tapered plastic, making for quick attachment; and it has an adaptor to take any 1½" vacuum hose.

Available, too, from Craftools is its new 75-page heavily illustrated catalog. Prices and complete descriptions of items are included.

For more information about Dust Boy and a copy of the catalog, write to the company at 396 Broadway, New York 13, N.Y., mentioning SCHOOL SHOP; or *circle no. M-9 on the business-reply card.*

New Literature:

Maid-O'-Metal "Memos" bulletins are now issued regularly by St. Louis Crafts, Inc., to help keep metal-craft hobbyists and teachers in touch with new ideas, new designs, and instructions for unique effects. To receive the "Memos" bulletin and other literature including a "how-to" booklet, write the company, St. Louis 19, Mo., mentioning SCHOOL SHOP; or *circle no. M-10 on the business-reply card.*

Masterpieces of High-Fidelity Equipment by Arkay is a new 16-page catalog which contains descriptions of more than 50 kits being marketed for making instruments, radios, hi-fi and stereo equipment, and television receivers. For a copy write Arkay, 88-06 Van Wyck Expressway, Richmond Hill 18, Queens, N.Y., mentioning SCHOOL SHOP; or *circle no. M-11 on the business-reply card.*

15,000 Repro-Templets is the name of the new 1959, 102-page catalog offered by Repro-Templets, Inc. Templets of machines, shop equipment, material-handling equipment, and architectural details are shown in exact ¼" scale. For a copy write to the firm on school stationery, requesting the catalog. Address your letters to Repro-Templets, Inc., Oakmont, Pa., mentioning SCHOOL SHOP.

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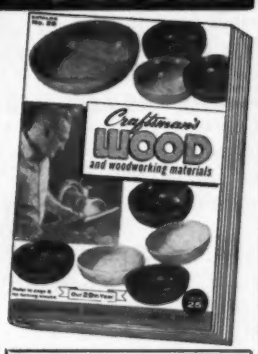

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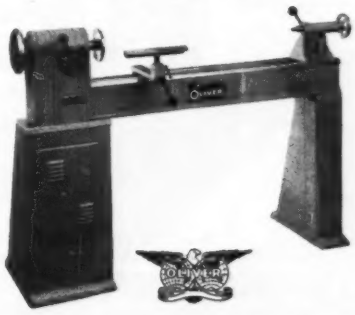

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Washington . . . . *from page 40*

gress votes for education "become state funds.")

And, to round out the brief glimpse at the legislative items, new pressure is building up for the Congressional enactment of bills designed to get some corrective action on juvenile delinquency.

Not much is likely to happen to any of these measures at this session of Congress, because the feeling persists on Capitol Hill that perhaps education has already been served well by the National Defense Education Act of 1958. But how well is education being served under the law?

This law, you will remember, was advertised as a $887 million measure. That figure was supposed to cover four years. For the first year some $183 million were authorized; $40 million were appropriated; and an additional $75 million (as a supplemental appropriation) were requested. It is unlikely that the supplemental $75 million will be coming forth in time this year to be of any help to schools and colleges. Hence, the authorized $183 million for the year ending this June will shrivel to the sum appropriated so far—$40 million.

What about next year? The law calls for spending $225.5 million; the budget asked for only $150 million. Congress will approve the sum as requested—but even so, the over-all figure for the first two years falls far short of the amount specified in the law.

Those who want more money from Washington for the support of education are using figures of the sort cited above to jar Congress out of its feeling that it has done enough for education in 1958-1959. But Congress is in no mood to be stampeded into voting more money for the National Defense Education Act. "Let's see what they do with the money we have given them so far," sums up the Congressional attitude toward education this month.

The Price for Security.—It has been a long time since the words "surplus property" have appeared in these dispatches, but here they are again, for two reasons:

First, the military establishments have accumulated $60 billion worth of equipment and supplies they cannot use and must dispose of as rapidly as possible.

Second, Secretary Arthur S. Flemming, of the Department of Health, Education, and Welfare, registered his official disappointment that schools are failing to take advantage of the cost-free stuff.

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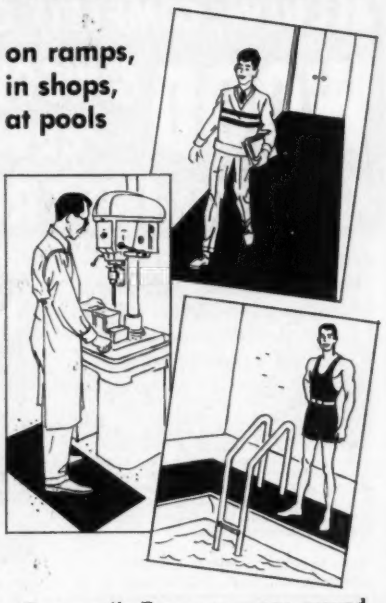

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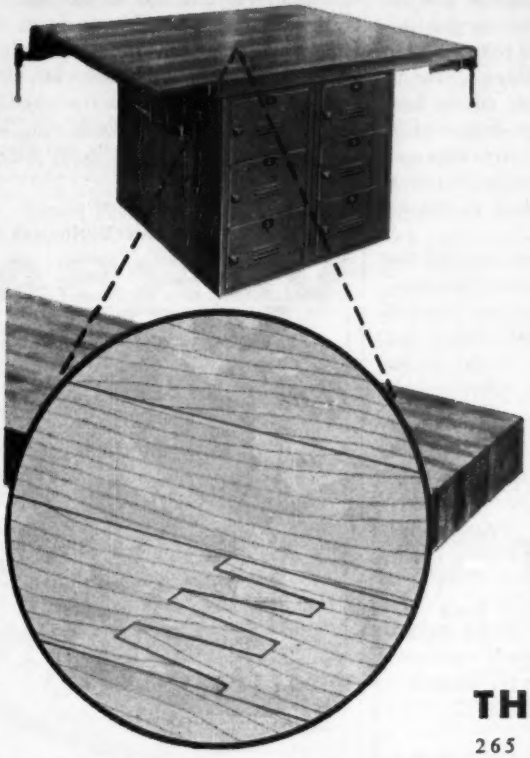

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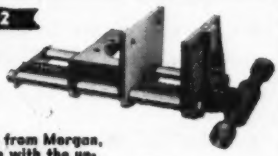

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ment may or may not fill the Grand Canyon. If not, it would come pretty close to doing so. If the existence of this surplus appears to be a staggering fact, it is one of the prices we pay for security. The Pentagon is matter of fact about the matter. Its position is that since we must spend billions of dollars for war weapons and materiél, and since these are not destroyed in war, then a good deal of the property naturally becomes obsolete.

The size of the problem can also be measured by the fact that surplus accumulates at the rate of $9 billion a year and that it costs $100 million a year to store the surplus. And no matter how hard the Pentagon tries to dispose of it, the sales, throwaways, and giveaways succeed only in chipping away at the mountains of surplus rather than in moving them.

Name any item under the sun, and you can probably find it marked "surplus" by one of the military agencies. Much of it is big stuff—tanks and planes—but there are smaller items useful in instructional programs of schools—helicopter parts and bolts.

Mr. Flemming's disappointment is caused by the fact that schools are not doing much even to chip away at the mountains of surplus. He acknowledged that some vocational educators are picking up machine tools for trade-and-industrial instruction at a brisk rate. But overlooked by them are items which,

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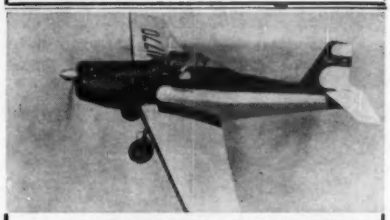
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with a bit of imagination, could be adapted for instruction in trade-and-technical education. Among them are nautical and navigation instruments, radio and radar equipment, electric motors and generators, photographic equipment, lenses, and electronic parts.

Getting down to the how-to-do-it level, Mr. Flemming suggests that the way to acquire surplus is first to get in touch with your state surplus-property agency; find out the terms under which you can get material; tell the agency what you need and can use; visit warehouses; and keep alert to bargains sales and give-away events.

If you're skeptical of the value of this material, please note that students in a Kentucky high school operate a ham radio station built from surplus; that in a Virginia technical school students operate their own TV station, courtesy of surplus items. And to take another tack, note, too, that in 1958 vocational schools acquired 7476 machine tools, originally worth nearly $14 million. Mr. Flemming promises: "As patterns of defense production continue to change, even more machines are expected to be available in the tools-for-schools program. These machine tools should be in especial demand for area vocational-education programs now being established or expanded under Title VIII of the National Defense Education Act."

Fine and/or Industrial Arts.—Let's see now, the art teacher is somewhere upstairs, presumably promoting skills of creative design and attitudes of esthetic appreciation; and the industrial-arts teacher is in the basement (in some schools, at least) teaching, grimy-handed, how to make a leather-covered footstool.

The above sketch may appear to you as a caricature of what really exists. But such conditions still exist—and there is one man in Washington who believes that the art teacher and the industrial-arts teacher may do well to meet somewhere midway between the studio-classroom and the shop. The man is Mayo Bryce, specialist in education for fine arts in the U.S. Office of Education. Dr. Bryce has been on the job since October, 1958. He is a former professor of arts and education at San Francisco State College. In his federal job, Dr. Bryce is supposed to cover the fine arts, music, and theater in both elementary and secondary grades, making it one of these catch-all jobs so common in the federal establishment. But it is his very breadth of interest that prompted Dr. Bryce to say: "Industrial arts can provide as rich opportunities for the creative and artistic talents as paint-

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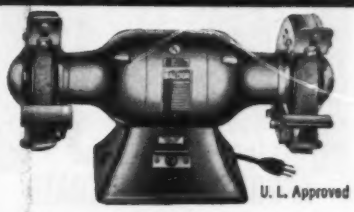
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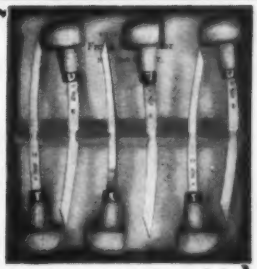
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ing or drama. There is no reason why a piece of furniture on which pupils work in the shop should not be as beautiful as a poem. The trouble, of course, is that in many industrial-arts shops the end dominates the processs . . ."

"Would you explain that?"

"I mean that in some industrial-arts classes the student and teacher are first concerned with 'What shall we make?' This leads immediately to plans for the project, rather than to thinking about the creative process that will go into the work."

Dr. Bryce believes that the industrial-arts teacher should know design, and that the art teacher should know industry. And if the two were thus equipped and were to have more frequent contact, both of their areas of education would profit considerably.

He further believes that the child today—and especially tomorrow—will need more skills to make things. Technology may well take care of making the machines and gadgets required for life. But "new strengths," Dr. Bryce said, will be required for living. "Strong creative resources and emotional reserves must be cultivated in children to face the world of tomorrow." Such creative resources can be cultivated in the child because for one thing, Dr. Bryce says, the child is a creative being. He puts his senses to work for creative purposes. His mind is almost habitually on the threshold of flights of fancy. As such, he becomes a subtle subject in the hands of a creative teacher.

This excursion into the ideas behind fine arts may be of some value for the industrial-arts practitioner. There is a growing feeling that the industrial-arts and the art teacher will inevitably be drawn closer together and the sooner this happens the better it will please a good many people.

Marriage Proposal.—Included in the "good many people" is the man who was in the same position that Dr. Bryce is now serving. He is Ralph Beelke, who after leaving that federal post became the executive secretary of the National Art Education Association. This group now has some 5,000 members, and we are told that among them is a sprinkling of industrial-arts teachers who believe that a marriage between industrial arts and fine arts would be fine for both.

Dr. Beelke has just returned from his association's annual convention (held in New York City, March 9 to 14) and has brought with him the on-the-record expressions of his officers and members.

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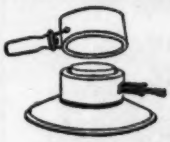

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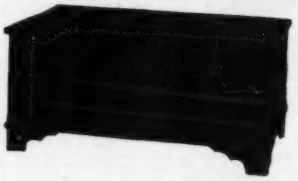

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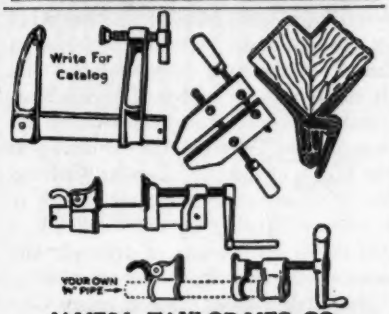

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There are many thought-starting items in these papers, and from them we should like to quote three that have application to both fine-arts and industrial-arts workers.

Item: "Fundamental to all arts processes is something called design. Design (is) organizing seemingly unrelated elements into an esthetically satisfying unity."

Item: "We must examine the nature of present-day living and emphasize and add esthetic awareness to the expression of that living."

Item: "It is often erroneously assumed that in some magical way work with art media will automatically result in creativeness, awareness, esthetic understanding, the solution of art problems of daily living, and personal or selfexpression. These are not incidental by-products that come from spreading paint on canvas, chipping a rock, or bending wire but are the resultants of direct, forceful, and intelligent teaching."

Here, then, are three theoretical principles that might prove quite practical for the instructor of industrial arts. But "how do you relate them to actual practice?" we asked Dr. Beelke and his reply was in effect:

You might try reading a piece on this subject scheduled for publication in the May issue of *Art Education*, the association's official journal. We learned that the piece was written by Robert Goldman, who is head of fine and industrial arts in a Philadelphia high school, and that it will be called "Manipulative Arts for the Junior and Senior High School." Dr. Beelke promised to send us a copy of the piece and we promised to read it. ★

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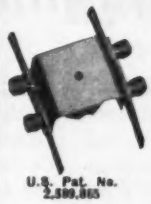

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by Michael Paca

Another Training Job?—Poverty is still with us, or to put it more precisely, it is still a stark fact confronting many people in many a community—isolated from the affluence that is supposed to have affected the rest of society.

To get it down to statistics, 260 industrial communities suffer from unemployment (at least 6 workers out of every 100 being jobless). About 1000 rural counties in the U.S. have substantial numbers of farms whose net income for any one year hovers at about $1000.

In short, unemployment, underemployment, and low income are creating "blight and decay" in many parts of the U.S.—and the remedy against them, in the opinion of some senators, lies with the area redevelopment act. Vocational educators are interested in the act because training is proposed by the act as one of the measures against low earning power.

For the past several weeks, therefore, vocational educators have been trooping up Capitol Hill to support the area redevelopment act and to suggest that state boards of vocational education be given clear-cut authority to carry on the training for those who find themselves without saleable skills.

"Clear-cut" is no dress-up word here, because the act is pretty wooly on how the vocational training is to be administered. The section dealing with vocational training (here we're reading the language of S. 722) calls on the Secretary of Labor to "consult" with the Administrator (a new post to be created under the act) and to "cooperate" with the Secretary of Health, Education, and Welfare. That would require three functionaries to be involved in training. And these three, naturally, would have to consult and cooperate further with the state and local officials in charge of vocational training—else nothing could happen. It isn't hard to predict that such a fuzzy arrangement would inevitably require "coordination," "clarification," and a host of other actions until there is finally established a clearly defined line of responsibility.

Hence, when President H. H. London, of the American Vocational Association, testified before the Senate Subcommittee in charge of this bill, he urged that the fuzziness be taken out now. In his words: "We believe . . . the state and local vocational-education authorities are in a position to make decisions about the need for and the nature of vocational training essential for the redevelopment of low-income and depressed areas." Mr. London did not mean to suggest that the Department of Labor be eliminated from the picture—for, after all, Department of Labor statistics will determine which communities will need the help from the redevelopment administration (if and when it is set up). After listening to Mr. London's ideas, Senator Paul Douglas (D., Ill.) said: "It is a very important administrative suggestion which we will go over."

Peanuts for Education. — Senator Douglas is chief sponsor of the area redevelopment bill and he is pushing hard for its enactment. He is a bit impatient with the cool reaction he is getting from the Eisenhower Administration. Back in September, 1958, Mr. Eisenhower had vetoed a similar area redevelopment bill, and it is likely that the President will do so again, should Congress decide to approve it this year.

But neither prospects of a veto, nor of inaction by Congress itself, deters the busy Washington lobbyist who has a bill to push. And so pressure continues on behalf of the area redevelopment bill. It continues also on behalf of the Murray-Metcalf bill, though its chances for approval in Congress are dwindling as the breath of summer comes to Washington. Pressure continues also, though in a lessened degree, for the Udall bill, a bill strong on the side of principle and weak on the side of political practicality. (The Udall bill asks that any grants Con-

(*Continued on page* 34)

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63	Proto Tool Co.	5
64	Radio Shack Corp.	29
90	Sales Service Mfg. Co.	31
65	Howard W. Sams & Co.	27
66	Sax Bros. Co.	37
67	Seeley's Ceramic Service	37
88	E. H. Sheldon Eqpt. Co.	5
68	Sheldon Machine Co.	16
69	Skil Corp.	5
70	Skyhopper Aircraft	37
71	South Bend Lathe Works	Cov. 2
72	Stanley Tools	Cov. 3
73	Stewart Clay Co.	32
74	James L. Taylor Mfg. Co.	39
75	Telephone Engineering Co.	37
76	Tepping Studio Co.	39
77	Thos. C. Thompson Co.	38
78	Tolerton Co.	35
79	Torit Mfg. Co.	30
80	Universal Scientific Co.	21
81	V & E Mfg. Co.	27
85	Versa-Vise	36
82	Watchemoket Optical Co.	22
83	Watchemoket Optical Co.	33
84	Western Wood Mfg. Co.	17
86	Wilton Tool Mfg. Co.	3
87	Yates-American Machine Co.	25

FOR COMPLETE PRODUCT INFORMATION USE THIS CARD

School Shop: Please have Companies whose numbers I have circled below send me complete product information without further obligation. (This card is good until July 31, 1959.)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140

"News from Industry" Items

Please send me the following items listed in the "News from Industry" section of this issue of SCHOOL SHOP:

M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
M11	M12	M13	M14	M15	M16	M17	M18	M19	M20

Name _____

School _____

School Address _____

City, Zone, State _____

Subjects taught: _____

_____

Books Worth Ordering

Please send me the book, "Modern School Shop Planning" ($3.85) ..... ☐

Please send me the handbook, "Machinists' Ready Reference" ($1.50) ..... ☐

Above books will be sent for free 30-day examination with return privilege.

5-59

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

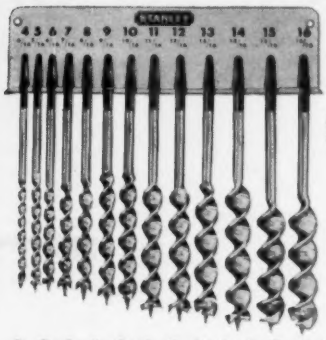
First Class Permit No. 200, Ann Arbor, Mich.

SCHOOL SHOP

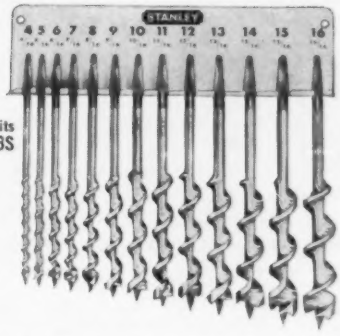
330 Thompson Street

Ann Arbor, Michigan

STANLEY SHOP TALK



AUGER BITS IN RACKS



Stanley Russell Jennings Bits
Set No. 1013S

Stanley Solid Center Bits
Set No. H1213S

13 sizes of auger bits in this useful rack, with a notch for each size indicated by number and by sixteenths so your boys can always return them to the right notch. The metal rack is supplied with each set of bits ordered. Sizes from 4/16 to 16/16 inches.

STANLEY STEELMASTER

The finest hammer ever made! Tubular steel handle that will not break under normal use . . . has shock absorbent neoprene grip. Rim of face is induction coil tempered . . . an important safety feature that minimizes chipping. Perfectly balanced. Available now in 13, 16 and 20 oz. curved claw models, and 16 and 20 oz. ripping claw models.

"Boy-Proof" WOOD CHISEL

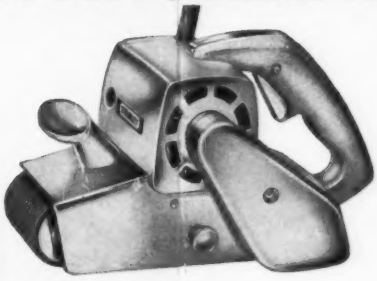
with 4½" Blade

STANLEY No. 40—Sturdy "Boy-Proof" for trouble-free performance in school shops. One-piece alloy steel blade and shank extend almost through the handle. Tough plastic handle assembled to blade—will not come loose. Steel cap on handle transmits hammer blow directly to cutting edge of blade. Blade has excellent and uniform cutting qualities. Made in complete range of sizes. Longer blade provides extra grinding life. (1/8" size 3-1/2" blade).

HEAVY DUTY ELECTRIC TOOLS

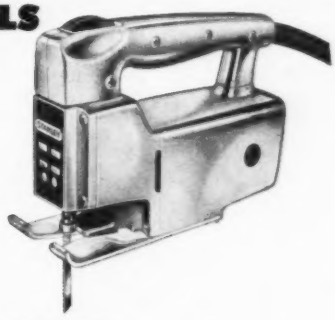
H264 ROUTER

This ⅞ hp Stanley Router is packed with many new features. Safe Switch-Shaft Lock starts and stops router and automatically locks shaft. Spot Light lights the way along the work.



H31 BELT SANDER

The Stanley Belt Sander takes the work out of sanding, whether it's for rough sanding or fine finishing of wood, metal or plastic. Easy to change 3" x 24" belts.



H75 SABRE SAW

The sabre saw is a versatile portable saw furnished with three blades and eighteen more to select for every use. It will rip, crosscut or jig saw and will also cut plastics, rubber and metal.

Use this coupon for more detailed information and school shop help

STANLEY®

STANLEY TOOLS, Educational Dept.,
725 Elm Street, New Britain, Conn.

FREE ( ) Please send me Stanley Tool Catalog No. 34
FREE ( ) Please send me the Stanley Electric Tool Catalog 589

Name .....
Subject you teach .....
School .....
Address .....
City ..... Zone ..... State .....

Model 65 10" Arbor Saw

Precision-Built For Unexcelled Performance In High Production, At The Building Site or In The Smallest Shop

EXCLUSIVE NEW POWER!

No weight on pivot shaft! New C-flange motor mount design.

Perfect trunnion alignment! Built of precision-machined grey iron castings.

Quick, easy fence adjustment! Front bar calibrated for accurate Vernier control.

- **BUILT FOR MOTORS FROM 1½ to 3 HP.**
- **TILTING BLADE CUTS 3⅛" AT 90°, 1⅞" AT 45°.**
- **FULL 28 x 38" TABLE WITH STANDARD EXTENSIONS.**

Powermatic introduces a brand new 'workhorse' for big jobs as well as the small ones!

Ruggedly built of heavy-gauge steel and finest grey iron castings, this is the most powerful tilting arbor saw on today's market. This new power means you cut faster, more accurately . . . cut full 25" with standard table extensions. Blade tilts *away* from fence for added safety and, with optional extensions, table handles stock up to 100" in length with ease! Table extensions are *solid* for true accuracy.

Be sure to get full details on this new Powermatic champion now!

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POWERMATIC
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Dealers In Principal Cities

PLEASE RUSH ME FULL INFORMATION ON:

- ☐ 10" & 12" ARBOR SAWS
- ☐ 6" & 8" JOINTERS
- ☐ 12, 16, 20, 24" PLANERS
- ☐ 14" & 20" BAND SAWS
- ☐ HOLLOW-CHISEL MORTISERS
- ☐ 15 & 20" DRILL PRESSES
- ☐ 2-A TENONER
- ☐ CHAIN MORTISERS

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